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**REZUMATE**

**Băjenescu Titu-Marius I. Fotovoltaicele într-o lume de tranziție către energii regenerabile.** Se trec în revistă starea actuală al fotovoltaicii, eficacitatea celulelor, componentele-cheie ale unui sistem de putere fotovoltaic, creșterea globală a pieții fotovoltaice, proiecte noi de celule fotovoltaice, filmele subțiri, câteva tendințe din industria fotovoltaică și problema stocării energiei.

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**Adascalitei A., Secieru N., Todos P. Cursuri universitare OER MOOC funcționale prin utilizarea Moodle Platform.** Lucrarea descrie o secvență pedagogică eficientă de subiecte și metode de blended learning a analizei circuitelor electrice în structura MOOC (Masive Cursuri deschise online). Această lucrare prezintă modul de a preda folosind web, Resurselor Educaționale Deschise (OER), componente web, desigur, și structura procesului de instruire. Aceste medii de învățare virtuale va îmbunătăți performanțele studenților în cursurile de inginerie oferite la Universitatea Tehnică „Gh. Asachi” Iași și Universitatea Tehnică a Moldovei. Metodologia noastră web-based de instruire se concentrează pe predarea acestor abilități de rezolvare sistematică a problemelor. Dezvoltarea de materiale de curs pentru studenți-ingineri din România și Republica Moldova va avea un impact tot mai mare pe scena națională a educației inginerie. Cercetarea și dezvoltarea de materiale online dedicate dezvoltării resurselor umane și a potențialului uman va accelera procesul de transfer de tehnologie up-to-date.

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**Bostan I., Secieru N., Candraman S., Margarint A., Barbovschi A. Conexiunea infrastructurii Centrului Național Tehnologii Spațiale la rețeaua globală educațională de operațiuni satelitare.** Această lucrare reflectă o metodă inovatoare de conectare și transmitere de date între un satelit și stațiile terestre. Autorii sugerează utilizarea unei rețele distribuite de stații terestre, care primesc simultan sau separat date de la sateliți. Sunt prezentate noi soluții, care să permită îmbunătățirea calității recepției datelor în comparație cu o singur set de antene. Ulterior, se arată o realizare propusă ca rețea distribuită de stații terestre cu descrierea protocoale de transmisie, de transmitere și de stocare a datelor, sistemul de autorizare, dispozitivele și operatorii de comunicații. Această rețea este o parte a proiectului satelitar, dezvoltat de studenții de la Universitatea Tehnică a Moldovei.

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**Krylov E. A., Martynov V.I. Analiza influenței naturii fazei solide asupra proprietăților betonului celular.** Este expusă ipoteza privind dependența proprietăților materialelor cu porozitate mare în

funcție de caracterul distribuției fazei solide, prezentate de două elemente ce determină structura – particulele fazei solide (pereții despărțitori dintre pori) și suprafețele interne de divizare. Pentru a confirma ipoteza, betonul spumant este prezentat într-o formă deschisă de auto sistem capabil de organizare a structurilor. Sunt prezentate etapele de formare a structurii materialului în stadiul inițial. Lungimea suprafețelor interioare de divizare este prezentată în formă de modele. De asemenea, pe modele s-a studiat influența tipurilor de ambalaje de pori, de forma lor, de porozitate, raportul apă/substanță solidă, de caracterul structurii fazei solide.

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**Solonenko I. Asigurarea unei acoperiri de performanță din beton pentru drumuri, datorită modificării lui.** Sunt prezentate rezultatele cercetărilor influenței asupra proprietăților acoperirilor din beton, destinate pentru drumuri, care conțin în componența lor adaos plastifiant și fibre de polipropilenă. Sunt calculate modelele matematice, care descriu modificările caracteristicilor fizico-mecanice și de exploatare ale acoperiri cercetate. Se prezintă recomandări privind utilizarea rezultatelor cercetărilor în construcția de drumuri auto.

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**Marina V., Marina Viorica. Metodologia reprezentării matriceale și analiza tensorului constantelor de elasticitate de ordinul opt.** În lucrare este prezentat tensorul de ordinul opt. Numărul de constante independente de elasticitate este analizat în funcție de simetria tensorilor tensiune/deformație și elementelor de simetrie care provin din principiile termodinamicii.

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**Polcanov V.N., Ceban O., Osadcenko K.A. Reconstrucția Catedralei „Nașterea Maicii Domnului binecuvântată” de la Mănăstirea Curchi.** Majoritatea edificiilor de cult, în special cele situate în localitățile rurale, se poziționează în cadrul teritoriului potențial alunecător. Structura specifică a versanților din regiune determină dezvoltarea deformațiilor lente de fluaj. Prin urmare, sunt observate deformațiile construcțiilor și edificiilor situate în cadrul lor. În cazuri particulare, astfel de deplasări se soldează cu consecințe catastrofale: pentru perioada ultimilor 10 ani în Moldova s-au distrus 17 monumente arheologice, 9 monumente istorice culturale. Mai jos este prezentat exemplul de consolidare a unui monument arhitectural din sec. XIX.

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**Kalashnikova V. Optimizarea locuințelor de lux în conformitate cu indicatorii de confort psihologic.** Procesele sociale, transformările material-spațiale ale

mediului orașelor și schimbarea stilului de viață în Ucraina au înaintat noi cerințe pentru proiectarea locuințelor de lux. Există o nevoie pentru dezvoltarea unor modele avansate de locuințe de lux, care pot oferi un confort integrat de viață, ținând seama de aspectele fiziologice și psihologice.

**Kucherenko A.A., Albu-Hasan Ahmed Mousa Abdulhadi. Despre elementele minerale și ingineria genetică în procesul de stingere a varului.** Procesul de stingere a varului creează un mediu gazoturbulent de temperaturi ridicate (până la 100° C) și alcalinitate (pH până la 12). Prin introducerea în el, împreună cu apa de hidratare, a activizatorilor silicatici (sticlă solubilă sau GKJ-94) se poate obține izo- sau polimorfism sau de a obține substanțe noi, cu caracteristici fizico-mecanice mai bune decât ale Ca(OH)<sub>2</sub>. Pe baza pastei de calcar modificat se poate produce betoane, în care, împreună cu calcitul CaCO<sub>3</sub>, apare și aragonit (4CaSO<sub>3</sub>), cu rezistență sporită la apă și duritate.

**Candraman S., Secrieru N. Cercetarea amplasamentului magnetometerelor pe bordul microsatelitului.** Domeniul de cercetare a acestei lucrări este de a determina poziția optimă a senzorului de câmp magnetic în cadrul carcasei satelitului SATUM. Se propun două variante cercetate spre realizare, amplasarea spre exterior sau chiar poziționarea pe un sistem telescopic care se declanșează după lansarea pe orbită.

**Levineț N., Ilco V., Gîrșcan A., Secrieru N. Recepția și procesarea datelor satelitare telemetrice prin radio software definit.** În lucrare este reprezentată arhitectura stației de recepție a datelor telemetrice satelitare bazat pe o arhitectură software, numită și Software Defined Radio. Astfel blocurile de corecție Doppler, filtrare, demodulare și de decapsulare a datelor recepționate prin protocolul AX.25 sunt create cu ajutorul limbajelor de programare. Trecerea de la partea hard la partea soft oferă posibilitatea de modificare a funcționării stației telemetrice în dependență de datele de intrare pentru fiecare bloc. O stație telemetrică bazată pe SDR poate fi reconfigurată pentru modificarea principiului de funcționare a demodulatorului sau de reconfigurare a metodei de decapsulare a datelor în dependență de protocolul de comunicare cu sateliți. Totodată configurând datele orbitale ale oricărui satelit și ținând cont de poziția stației terestre se poate omite efectul Doppler. Comparativ cu arhitectura radio tradițională, cea definită prin software oferă o flexibilitate înaltă, economie de timp și este o soluție eficientă pentru o serie de aplicații.

**Levineț N., Ilco V., Gîrșcan A., Secrieru N. Proiectarea arhitecturii software a calculatorului de bord a microsateleților cu utilizarea limbajului SYSML.** În lucrare se prezintă experiența procesului de proiectare arhitecturală a softului pentru calculatorul de bord a microsateleților în baza limbajului formal SYSML. Proiectarea se realizează prin metoda top down, care vizează definirea evenimentelor și proceselor de funcționare a sistemelor satelitului, prin elaborarea diagramelor SYSML. În mediul de proiectare cu ajutorul diagramelor se generează structura programului, aceasta structură oferă o fiabilitate și o rapiditate înaltă de funcționare. Experiența acumulată arată că datorită proiectării inverse (reverse engineering) poate fi micșorat timpul de testare, iar mediul de proiectare va permite corectarea și generarea automată a documentației electronice.

**Bostan I., Dulgheru V., Bodnariuc I. Aspecte tehnologice ale transmisiilor planetare precesionale cinematice cu roți de plastic.** Această lucrare descrie elaborarea transmisiilor planetare precesionale cinematice cu roți dințate din material plastic - oțel. Pentru a reduce frecarea de alunecare în angrenajul precesional cinematic a fost utilizat cuplul de material "plastic - oțel". Acest fapt a permis creșterea randamentului și soluționarea problemelor legate de tehnologii de fabricație pentru coroanele danturate ale blocului satelit. Dinții roții centrale au profil convex concav nestandard variabil descris de ecuații parametrice conform teoriei fundamentale a angrenajului precesional. Deoarece dinții satelitului au profil circular acest fapt asigură fabricație relativ simplă. Prezenta lucrare conține o justificare amplă a metodei de selecție a materialelor plastice necesare pentru fabricarea roților dințate. De asemenea, sunt prezentate criteriile de selecție a maselor plastice și de funcționare a lor.

**Bârsan, A. Posibilități de optimizare a cinematicii mecanismelor malteze.** Lucrarea propune câteva variante de optimizare a cinematicii mecanismelor de tip maltez. Sunt prezentate trei mecanisme: mecanismul maltez cu canale curbe, mecanismul maltez cu canale de tip „Y” și mecanismul maltez clasic acționat prin intermediul unui mecanism cu camă.

**Paraschiv Dr., Merticaru V. jr., Crețu Gh. Rezultate comparative privind rugozitatea obținută pe suprafețe prelucrate prin metoda în vârtej.** Lucrarea conține o prezentare comparativă a unor rezultate experimentale privind rugozitatea obținută pe suprafețe prelucrate în vârtej, respectiv pentru melci cilindrici și filete exterioare trapezoidale.

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**ABSTRACT**

**Băjenescu Titu-Marius I. Photovoltaics in a transition world toward renewable energies.** An overview of the recent status of photovoltaic (PV) generation, the best research-cell efficiency, the key components of a photovoltaic power system, the growth of global PV market, new projects for PV cell, thin films, some trends in PV industry, and the storage problem are presented.

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**Adascalitei A., Secrieru N., Todos P. OER MOOC University Courses running by Using Moodle Platform.** The paper describes an i-pedagogically effective sequence of topics and methods for blended learning electric circuit analysis in a MOOC (Massive Open Online Courses) structure. This paper presents how to teach using the web, Open Educational Resources (OER), components of a course website, and the structure of the instructional process. These Virtual Learning Environments will improve student performance in engineering courses offered at Technical University „Gh. Asachi” Iassy and Technical University of Moldova. Our web-based instructional methodology focuses on teaching this systematic problem-solving skill. The development of courseware materials for student engineers in Romania and Moldova will have an increasing impact on the national scene of engineering education. The research and development of online materials devoted to the development of human resources and human potential will accelerate the process of transfer of up-to-date technology.

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**Bostan I., Secrieru N., Candraman S., Margarint A., Barbovschi A. National space technologies center infrastructure connection to global educational network for satellite operations.** The paper deal with an innovative method of connection and data transmission between a satellite and the ground stations. Authors suggest using a distributed network of ground stations, which simultaneously or separately receive data from the satellite. It are presented a new solutions, which allow improving the quality of receiving channel in comparison to an antenna array. Subsequently, a proposed realization of Distributed Ground Station System with description of transmission protocols, data transmission and storage, authorization system and devices and operators communication is shown. This network is a part of satellite project, developed by the students of Technical University of Moldova.

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**Krylov E. A., Martynov V.I. Analysis of solid phase impact on cellular concrete properties.** A hypothesis on correlation between the properties of highly porous

materials and the nature of distribution of its solid phase represented by two structure forming elements — particles of solid phase (partitions) and internal interfaces — was put forth. In support of the hypothesis foam concrete is considered as an open self-organizing system capable of structure formation. Formation stages for internal interface elements were described at the early phases of material structure formation. Internal interface length is given as models. The models were also used to study the influence of pore packing, their shape, porosity, water/solid ratio on structural characteristics of the solid phase.

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**Solonenko I. Ensuring performance coatings of concrete for roads, due to their modifications.** Results of research of the influence on performance of coatings from concrete, destined for roads, when modifying their convoys off the additive and polypropylene fiber. Calculated mathematical models describing changes of physico-mechanical and operational characteristics, coatings, which are considered. Recommendations on the use of research results in the construction of highways.

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**Marina V., Marina Viorica. Methodology of matrix representation and analysis of tensor of elasticity constants of eight order.** In the paper the tensor of eight order was presented. The number of independent components was analysed in function of symmetry of stress/strain tensors and those symmetry elements, which result from thermodynamic principles.

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**Polcanov V.N., Ceban O., Osadcenko K.A. The reconstruction of the "Birth of the Blessed Virgin Mary" Cathedral at the Curchi Monastery.** Most places of worship, especially in rural areas of Moldova, are located on a potentially dangerous territory. The specific structure of the hillside of the region may determine development of movements, like for example slow creep deformations. As a consequence, a deformation of buildings and structures located on them occurs. In some cases, such displacements end with catastrophic consequences: only in the last 10 years 17 archaeological sites and 9 historic-cultural monuments have been destroyed in Moldova. Presented below, is an example of the protection of an architectural monument from the XIX century.

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**Kalashnikova V. Optimization of the elite dwelling with the indicators of psychological comfort.** Social processes, material-space transformations of cities and lifestyle changes in Ukraine have put forward new

requirements for elite dwelling designing. There is a need to create perspective models of elite dwelling which can provide a complex comfort of living, including physiological and psychological aspects.

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**Kucherenko A.A., Albu-Hasan Ahmed Mousa Abdulhadi. About mineral genetic engineering elements in lime slaking process.** The process of clearing lump lime creates an environment gazoturbulent of high temperatures (up to 100° C) and alkalinity (pH up to 12). Introducing it with water to absorb, the silicate activators (liquid glass or GKJ-94) you can call iso- or polymorphism or get new substances with the best physical-mechanical characteristics than Ca (OH)<sub>2</sub>. On the basis of modified the limy test get concrete, which along with calcite CaCO<sub>3</sub> occurs and aragonite (4CaSO<sub>3</sub>), with increased durability and water resistance.

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**Candraman S., Secrieru N. Research of magnetometer placement on board of microsatellite.** The paper deals with the optimal placement of the magnetic field sensor on the board of microsatellite SATUM. We propose two variants investigated for implementation, location outwards or even on a telescopic system which is deployed after the launch into orbit.

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**Ilco V., Levineț N., Gîrșcan A., Secrieru N. Satellite telemetry data reception an processing via software defined radio.** In this paper is represented architecture of a reception telemetry station of satellite based on the software architecture, such as Software Defined Radio. Therefore, blocks as Doppler correction, filtering, demodulation and received data decapsulation for protocol AX.25 are created using programming languages. The transition from the hardware to the software part, offers the possibility to modify telemetry station operation depending on the input data for each block. A SDR-based telemetry station can be reconfigured to change the principle of operation of the demodulator or reconfiguration method of encapsulation depending on the protocol data communication satellites. At the same time configuring any satellite orbital data and taking into account the position of the earth station may be omitted Doppler effect. Compared to traditional radio architecture, the defined by software offers high flexibility, time savings and is an effective solution for a range of applications.

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**Levineț N., Ilco V., Gîrșcan A., Secrieru N. Software architecture design for microsatellite**

**computer board using SYSML language.** This paper presents the experience of software architectural design process for the microsatellite board computer based on formal language SysML. The design is achieved by top down method, which aims to set events and processes for satellite systems work by drawing SysML diagrams. In the design environment thanks to diagrams is generated program structure, which provides reliability and high-speed operation. Acquired experience shown that due to the reverse design (reverse engineering) may be reduced time testing and the design environment will allow correction and automatic generation of electronic documentation.

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**Bostan I., Dulgheru V., Bodnariuc I. Technological aspects of kinematic planetary precessional transmissions with plastic wheels.** This paper describes the elaboration of the kinematical planetary precessional transmissions with plastic – steel toothed wheels. To reduce the sliding friction in the gearing of the kinematic precessional transmission, the plastic - steel gearing has been utilized. This fact allowed increasing the efficiency, and solution of problems related to fabrication technologies for the crown gears of the satellite block. The teeth of the central wheel have nonstandard variable convex-concave profile described by parametric equations according to the fundamental theory of the precessional gear. Because the teeth of the satellite have circular profile this fact allow its relative simple fabrication. This work contains a broad justification of the method for plastic materials selection necessary for toothed wheels fabrication. As well, the plastic mass selection and functioning criteria are presented. Also a range of adequate materials for toothed wheels manufacturing are described.

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**Bârsan A. Optimization regarding the kinematics of the Geneva mechanisms.** The paper proposes some kinematical optimizing solutions for the Geneva mechanism. Three mechanisms are presented: a curved slotted Geneva mechanism, a “Y” type Geneva mechanism and a conventional Geneva mechanism driven by a cam mechanism.

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**Paraschiv Dr., Merticaru V. jr., Crețu Gh. Comparative results concerning the roughness obtained on surfaces cut by whirling method.** The paper contains a comparative presentation of some experimental results concerning the roughness obtained on surfaces cut by whirling method, respectively for cylindrical worms and for external trapezoidal threads.

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## SOMMAIRE

**Băjenescu Titu-Marius I. Photovoltaïque dans un monde de transition vers les énergies renouvelables.** On passe en revue l'état actuel du photovoltaïque, l'efficacité des cellules, les composants-clé d'un système de puissance photovoltaïque, la croissance globale du marché photovoltaïque, les nouveaux projets de cellule photovoltaïque, les films minces, quelques tendances de l'industrie photovoltaïque et le problème du stockage de l'énergie.

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**Adascalitei A., Secrieru N., Todos P. Cours universitaires REL MOOC fonctionnant à l'aide de la plate-forme Moodle.** Le papier décrit une séquence de i-pédagogie efficacité des sujets et des méthodes pour l'apprentissage mixte analyse de circuit électrique dans un MOOC (Massive ouverts Cours en ligne) structure. Cet article présente la façon d'enseigner en utilisant le web, les ressources éducatives libres (REL), les composants d'un site de cours, et la structure du processus d'enseignement. Ces environnements d'apprentissage virtuels permettront d'améliorer le rendement des élèves dans les cours d'ingénierie offerts à l'Université technique de Iasi, et de l'Université Technique de Moldavie. Notre méthodologie d'enseignement basé sur le Web met l'accent sur l'enseignement de cette compétence de résolution de problème systématique. Le développement de matériaux de didacticiels pour les élèves ingénieurs en Roumanie et la Moldavie aura un impact croissant sur la scène nationale de l'éducation de l'ingénierie. La recherche et le développement de matériaux en ligne consacrés au développement des ressources humaines et le potentiel humain permettra d'accélérer le processus de transfert de la technologie mise à jour.

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**Bostan I., Secrieru N., Candraman S., Margarint A., Barbovschi A. Connexion de l'infrastructure du centre national des technologies spatiales de réseau éducatif mondial pour l'exploitation de satellites.** Cette papier présente une méthode innovante de connexion et de transmission de données entre un satellite et les stations terrestre. Les auteurs suggèrent d'utiliser un réseau distribué de stations au sol, qui reçoivent simultanément ou séparément des données du satellite. Il est présenté un nouveau solutions, qui permettent d'améliorer la qualité de réception de canal par rapport à un réseau d'antennes. Par la suite, un projet de réalisation d'Distributed système de station terrestre avec description des protocoles de transmission, transmission de données et de stockage, système d'autorisation et appareils et les opérateurs de communication est affiché. Ce réseau est une partie du projet de satellite, développé par les étudiants de l'Université Technique de Moldavie.

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**Krylov E. A., Martynov V.I. Analyse de l'impact de la phase solide sur les propriétés du béton**

**cellulaires.** Émis l'hypothèse reliant les propriétés des matériaux hautement poreux de la structure avec le caractère de la répartition de la phase solide, présentée par des particules de la phase solide (cloisons) et les surfaces intérieures de la partition (VPR). Pour confirmer l'hypothèse de penobeton présenté dans la forme ouverte de l'auto-organisée d'un système capable de l'organisation des structures. Récapitule les étapes de l'éducation éléments RECHERCHEV dans les premiers stades de formation de la structure de la matière. Longueur RECHERCHEV est présenté sous la forme de modèles. Également sur les modèles ont étudié les effets de types de colis du jour, de leur forme, de porosité, la relation à la nature de la structure de la phase solide.

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**Solonenko I. Assurer la performance des revêtements de béton pour les routes, en raison de leurs modifications.** Résultats de la recherche de l'influence sur les performances des revêtements de béton, sont destinés aux routes, lors de la modification de leurs convois au large de la fibre de l'additive et polypropylène. Calculer des modèles mathématiques décrivant les modifications des caractéristiques physico-mécaniques et fonctionnelles, sont considérés comme des revêtements. Recommandations sur l'utilisation des résultats de la recherche dans la construction de routes.

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**Marina V., Marina Viorica. Méthodologie de matrix représentation et analyse des tensor d'élasticité constantes de huit ordre.** Dans le document du tenseur de huit grade a été présenté. Le nombre de composants indépendants a été analysé en fonction de symétrie de tenseurs de contrainte / déformation et la symétrie des éléments celles qui résultent de principes thermodynamiques.

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**Polcanov V.N., Ceban O., Osadcenko K.A. La reconstruction de la cathédrale «Naissance de la Vierge Marie" du monastère Curchi.** La plupart des lieux de culte, en particulier dans les zones rurales de la Moldavie, sont situés sur un territoire potentiellement dangereux. La structure particulière de la colline de la région peut déterminer le développement des mouvements, comme par exemple les lentes déformations de fluage. En conséquence, une déformation des bâtiments et structures situés sur leur produit. Dans certains cas, ces déplacements se terminent avec des conséquences catastrophiques: seulement dans les 10 dernières années, 17 sites archéologiques et monuments historiques 9-culturelle ont été détruits en Moldavie. Présenté ci-dessous, est un exemple de la protection d'un monument architectural du XIXe siècle.

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**Kalashnikova V. Optimisation de l'habitation d'élite avec les indicateurs de confort**

**psychologique.** Les processus sociaux, transformations matériau et espace des villes et des changements de mode de vie en Ukraine ont mis en avant de nouvelles exigences pour la conception d'élite habitation. Il est nécessaire de créer des modèles en perspective d'habitation d'élite qui peuvent fournir un confort de vie complexe, y compris les aspects physiologiques et psychologiques.

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**Kucherenko A.A., Albu-Hasan Ahmed Mousa Abdulhadi. Sur les éléments minéraux génie génétique dans le processus d'extinction de chaux.** Le processus de compensation forfaitaire chaux crée la moyenne gazoturbulent de hautes températures (jusqu'à 100° C) et de l'alcalinité (pH jusqu'à 12). Introduction à l'eau pour absorber les activateurs silicate (le verre liquide ou GKJ-94), vous pouvez appeler iso- ou polymorphisme ou obtiennent de nouvelles substances avec les meilleures caractéristiques physiques et mécaniques que le Ca (OH)<sub>2</sub>. Sur la base de modifié le test calcaire get béton, qui, ainsi que de calcite CaCO<sub>3</sub> se produit et l'aragonite (4CaSO<sub>3</sub>), avec résistance accrue de durabilité et de l'eau.

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**Candraman S., Secrieru N. Recherche de stage de magnétomètre à bord du microsatellite.** Domaine de recherche de ce travail est de déterminer la position optimale du capteur de champ magnétique dans le Satum de logements par satellite. Nous proposons deux options étudiées pour la mise en œuvre, l'emplacement ou Position extérieur un système télescopique qui est déclenché après le lancement en orbite.

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**Iloco V., Levineț N., Gîrșcan A., Secrieru N. La réception et le traitement des données télémétrique par satellite avec la radio logicielle.** Dans cet article est présenté l'architecture d'une station de réception de télémétrie pour satellite, basée a une architecture logicielle, appelé Software Defined Radio. Ainsi, les blocs, comme Doppler correction, filtrage, démodulation et reçus protocole AX.25 sont créées en utilisant des langages de programmation. La transition à partir du "hardware" à "software" permet le fonctionnement de la station de télémétrie selon les données d'entrée pour chaque bloc. Une station de télémétrie à base du SDR peut être reconfigurée par modifier le principe de fonctionnement du procédé de démodulation ou de reconfiguration de décapsulation en fonction de communication protocole des satellites. Dans le même temps à la configuration des données orbitales de satellite et compte tenu de la position de la station terrienne peut être omis effet Doppler. Par rapport à l'architecture de la radio traditionnelle, tel que défini par le logiciel offre une grande flexibilité, des économies de temps et est une solution efficace pour une gamme d'applications.

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**Levineț N., Iloco V., Gîrșcan A., Secrieru N. Conception de l'architecture logicielle pour**

**l'ordinateur de bord de microsatellites en utilisant un langage SysML.** Le document présente l'expérience de processus de conception architecturale pour ordinateur de bord de microsatellite fondée sur la langue formelle SysML. La conception est réalisée par haut en bas, visant à définir les événements et les processus de fonctionnement des systèmes de satellites en dessinant des diagrammes SysML. Dans l'environnement de conception, avec des diagrammes est généré structure du programme, cette structure offre une grande fiabilité et une grande vitesse de fonctionnement. L'expérience accumulée montre qu'en raison de la conception inverse (reverse engineering) peut être réduit le temps de test et de l'environnement de conception permettra de rectification et de générer automatiquement des documents électroniques.

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**Bostan I., Dulgheru V., Bodnariuc I. Aspects technologiques de transmissions planétaires précessionnelle cinématique avec roues en plastique.** Ce travail décrit l'élaboration des transmissions planétaires précessionnelle cinématique avec roues dentées «plastique - acier». Pour réduire le frottement de glissement dans l'engrenage de transmission précessionnelle cinématique a été utilisée les matériau plastique - acier. Cela a permis accroître l'efficacité et la solution des problèmes liés aux technologies de fabrication pour les couronnes dentées du bloc satellite. Les dents de la roue centrale ont le profile convexe-concave variables non standard décrit par équations paramétrique selon la théorie fondamentale de l'engrenage précessionnelle. Parce que les dents du satellite ont des profils circulaires cela permettre relativement simple fabrication. Cet ouvrage contient une large justification de la méthode de sélection des matières plastiques nécessaires pour fabrication des roues dentées. En outre, sont présentées les critères de sélection de la masse plastique et leur fonctionnant. Également est décrite une gamme de matériaux adéquats pour la fabrication de roues dentées.

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**Bârsan, A. Optimisation de la cinématique de mécanismes de Malte.** Cet article présente quelques solutions pour optimiser la cinématique des mécanismes de Malte. Ils sont présenter trois variantes des mécanismes optimisés: un mécanisme avec des chenaux curviligne, un mécanisme hybride avec de chenaux en forme de „Y” et un mécanisme de Malte classique entraîner par un mécanisme a cam.

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**Paraschiv Dr., Merticaru V. jr., Crețu Gh. Résultats comparatifs regardant la rugosité obtenue sur des surfaces processus par la méthode tourbillonnaire.** Le papier contiens une présentation comparatif des résultats expérimentaux regardant la rugosité obtenue sur des surfaces processus par la méthode tourbillonnaire.



## РЕЗЮМЕ

**Бэженеску Титу-Мариус. Фотоэлементы в переходном мире к возобновляемым источникам энергии.** Приведен обзор современного статуса фотовольтаики, эффективности солнечных ячеек, ключевых компонентов силовой фотоэлектрической системы, роста глобального рынка PV, новых проектов фотоэлементов, тонких пленок, некоторых тенденций в промышленности фотоэлементов и проблема хранения энергии.

**Адаскалицей А, Секриеру Н., Тодос П. ООР МООК университетские курсы работающие с помощью платформы Moodle.** Статья описывает i-педагогически эффективной последовательности тем и методов для анализа смешанного обучения электрических цепей в МООС структуры (Массивные Открытые Онлайн курсы). Эта статья представляет, как научить с помощью Интернет, открытых образовательных ресурсов (ООР), компоненты веб-сайта, конечно, и структуру учебного процесса. Эти виртуальные среды обучения позволят повысить производительность студентов в инженерных курсов Ясского технического университета и Технического университета Молдовы. Наша веб-методология направлена на обучение систематического решения проблем. Развитие компьютерных учебных программ материалов будет иметь большее влияние на инженерное образование для студентов-инженеров в Румынии и Молдове. Исследования и разработка интернет-материалов, посвященных развитию людских ресурсов и человеческого потенциала позволит ускорить процесс передачи технологий up-to-date.

**Бостан И., Секриеру Н., Кандраман С., Маргаринт А., Барбовски А.** Подключение инфраструктуры Национального Центра космических технологий к глобальной образовательной сети для эксплуатации спутников. В работе приведены инновационные способы подключения и передачи данных между спутником и наземными станциями. Авторы предлагают использовать распределенную сеть наземных станций, которые одновременно или раздельно получают данные со спутника. Представлены новые решения, позволяющие улучшить качество приема канала по сравнению с одной антенной решеткой. Впоследствии, предложена реализация распределенной системы наземной станции с описанием протоколов передачи, передачи и хранения данных, системы авторизации и устройств и операторов связи. Эта сеть является частью спутникового проекта, разработанного студентами Технического университета Молдовы.

**Крылов Е. А., Мартынов В.И.** Анализ влияния характера твердой фазы на свойства ячеистых бетонов. Высказана гипотеза, связывающая свойства материалов высокопористого строения с характером распределения его твердой фазы, представленной

двумя структурообразующими элементами – частицами твердой фазы (межпоровых перегородок) и внутренними поверхностями раздела. Для подтверждения гипотезы пенобетон представлен в виде открытой самоорганизующейся системы, способной к организации структур. Приведены этапы образования элементов внутренних поверхностей раздела на ранних стадиях формирования структуры материала. Протяженность внутренних поверхностей раздела представлена в виде моделей. Также на моделях изучено влияние видов упаковок пор, их формы, пористости, водотвердого отношения на характер структуры твердой фазы.

**Солоненко И. обеспечение качества покрытия из бетона для дорог, вследствие его модификации.** Приведены результаты исследований влияния на эксплуатационные характеристики покрытий из бетона, предназначенного для автомобильных дорог, при модификации их составов пластифицирующей добавкой и полипропиленовой фиброй. Рассчитаны математические модели, описывающие изменения физико-механических и эксплуатационных характеристик исследуемого покрытия. Даны рекомендации по использованию результатов исследования при строительстве автомобильных дорог.

**Марина В., Марина Виорика. Методология матричного представления и анализ тензора констант эластичности восьмого порядка.** В работе представлен тензор восьмого порядка. Количество независимых констант эластичности анализирован в функции симметрии тензора напряжения/деформации и симметричности элементов происходящих из законов термодинамики.

**Полканов В.Н., Чебан О., Осадченко К.А.** Реконструкция Собора "Рождение Пресвятой Девы Марии" в монастыре Курки. Большинство культовых сооружений, особенно в сельской местности, расположено на потенциально-опасной территории. Особая структура склонов региона предопределяет развитие медленных деформаций ползучести. Как следствие, наблюдается деформации зданий и сооружений, расположенных на них. В отдельных случаях подобного рода смещения заканчиваются катастрофическими последствиями: только за последние 10 лет в Молдове разрушено 17 памятников археологии, 9 памятников истории культуры. Ниже представлен пример защиты памятника архитектуры XIX в.

**Калашикова В.** Оптимизация элитного жилья в соответствии с показателями психологического комфорта. Общественные процессы, преобразования материально-пространственной среды городов и изменения образа жизни в Украине выдвинули новые требования к проектированию элитного жилья. Существует необходимость создания перспективных

моделей элитного жилья, которые могут обеспечить комплексный комфорт проживания, учитывая физиологические и психологические аспекты.

**Кучеренко А.А., Албу-Насан Ахмед Моуса Абдулхади.** Об элементах минерально генной инженерии в процессе гашения извести. Процесс гашения комовой извести создаёт газотурбулентную среду высоких температур (до 100° С) и щёлочности (рН до 12). Внедряя в неё, с водой для гашения, силикатсодержащие активизаторы (жидкое стекло или ГКЖ-94) можно вызвать изо- или полиморфизм или получить новые вещества с лучшими физико-механическими характеристиками, чем Ca(OH)<sub>2</sub>. На основе модифицированного известкового теста получаем бетон, в котором наряду с кальцитом CaCO<sub>3</sub> возникает и арагонит (4CaCO<sub>3</sub>), с повышенными прочностью и водостойкостью.

**Кандраман С., Секриеру Н.** Исследование размещения магнитометра на борту микроспутника. Область исследования данной работы является определение оптимального положения датчика магнитного поля на спутнике жилья SATUM. Мы предлагаем два варианта исследования для реализации, местоположения или наружу телескопической системы, которая срабатывает после запуска на орбиту.

**Илко В., Левинец Н., Гырикан А., Секриеру Н.** Прием и обработка телеметрических данных с программно-определяемой радиосистемой. В данной работе представлена архитектура станции приема данных спутниковой телеметрии на основе программной архитектуры, называемой Software Defined Radio. Таким образом, блоки коррекции эффекта Доплера, фильтрации, демодуляции и декапсуляции данных, полученных через протокол ах.25 создаются с помощью языков программирования. Переход от аппаратных средств к программному обеспечению предлагает возможность модификации работы телеметрической станции в зависимости от входных данных для каждого блока. Телеметрическая станция, основанная на “SDR”, может быть изменена с целью модификации принципа работы демодулятора или реконфигурации метода декапсуляции данных в зависимости от протокола связи со спутником. В то же время при конфигурации орбитальных данных любых спутников и учитывая положение наземной станции можно скорректировать эффект Доплера. По сравнению с традиционной архитектурой радио, архитектура радио, реализованная с помощью программного обеспечения, обеспечивает высокую гибкость, экономию времени и является эффективным решением для широкого спектра приложений.

**Левинец Н., Илко В., Гырикан А., Секриеру Н.** Проектирование архитектуры программного обеспечения бортового компьютера микроспутников с помощью языка SysML. В данной работе представлен опыт процесса

разработки архитектурного проектирования программного обеспечения для бортового компьютера микроспутника на основе формального языка SysML. Проектирование осуществляется при помощи метода “Top down”, направленного на определение событий и процессов работы систем спутника, путем разработки SysML диаграмм. В среде разработки с помощью диаграмм генерируется структура программы, эта структура обеспечивает надежность и высокую скорость работы. Опыт показывает, что посредством обратного проектирования (reverse engineering) может быть снижено время тестирования, а среда разработки позволит исправление и автоматическую генерацию электронной документации.

**Бостан И., Dulgheru В., Боднарюк И.** Технологические аспекты планетарных прецессионных кинематических передач с пластиковыми колесами. Эта статья описывает разработку кинематической планетарной прецессионной передачи с зубчатыми колесами из пластика и стали. Для уменьшения трения скольжения в зацеплении планетарной прецессионной кинематической передачи была использована пара материалов «пластик – сталь». Это позволило повысить КПД и решение проблем, связанных с технологией изготовления зубчатых венцов сателлитного блока. Зубья центрального колеса имеют нестандартный выпукло-вогнутый переменный профиль, описываемый параметрическими уравнениями согласно фундаментальной теории прецессионного зацепления. Круговой профиль зубьев венцов сателлита позволяют сравнительно простое изготовление сателлита. Эта работа содержит широкое обоснование метода выбора пластмассовых материалов, необходимых для изготовления зубчатых колес. Кроме того, представлены критерии отбора пластмасс и их функционирования. Также описано ряд адекватных материалов для изготовления зубчатых колес.

**Бырсан А.** Оптимизацию кинематики мальтийских механизмов. В работе предлагаются несколько вариантов кинематики мальтийских механизмов. Представлены три механизма: мальтийский механизм с криволинейными канавками; мальтийский механизм с канавками типа „У” и классический мальтийский механизм, приводимый через кулачковый механизм.

**Параскив Др., Мертикару В. jr., Крецу Г.** Сравнительные результаты шероховатости, полученной на поверхностях, обработанных вихревым методом. Работа содержит сравнительное представление некоторых экспериментальных результатов шероховатости, полученной на поверхностях, обработанных вихревым методом, соответственно для цилиндрических червяков и и наружных трапецидальных резьб.

## ABOUT MINERAL GENETIC ENGINEERING ELEMENTS IN LIME SLAKING PROCESS

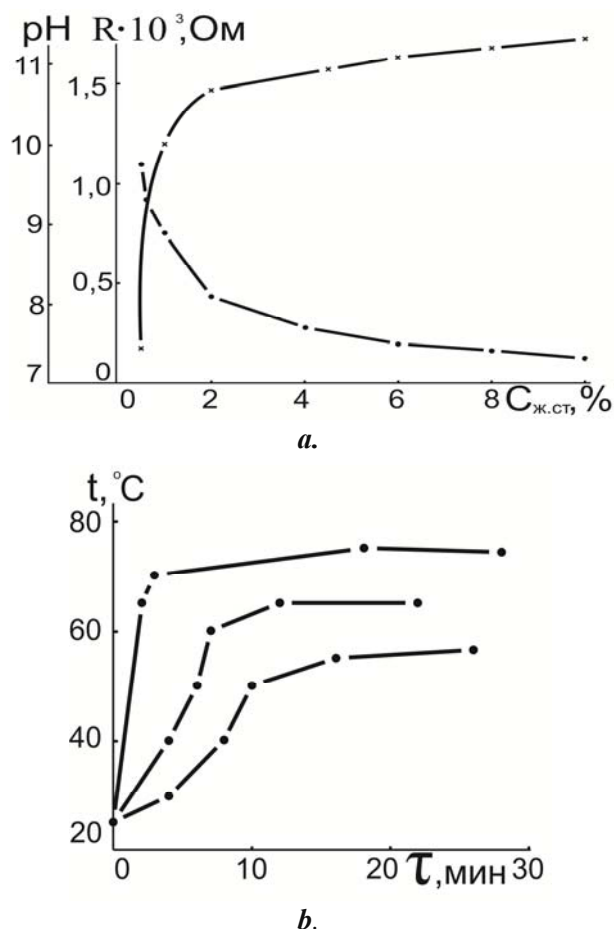
*Kucherenko A.A., PhD, Prof., Albu-Hasan Ahmed Mousa Abdulhadi, PhD student  
Odessa State Academy of Civil Engineering and Architecture, Ukraine*

Practical implementation of the foundations for mineral energy engineering [1] should be better kept on monomineral lime binder. The process of lump lime slaking with water creates environment favourable for chemical reactions with high thermal dynamic indicators of alkalinity ( $\text{pH} \geq 12$ ), high temperatures (up to  $100^\circ\text{C}$  and higher) and heat release ( $65,5 \text{ kJ/mol}$ ). This environment with important thermodynamic characteristics can be called "the waste" of production as it is almost not used as secondary useful resources. Meanwhile, alkaline environment is able to transform electrically neutral particle (molecules, crystals, etc.) into active (electrically charged, amorphous). Temperature increasing is also acceleration of chemical reactions in the environment lump lime extinction. Heat release at limp slaking is a volumetric heat treatment, causing chain reaction of reactants, not from the surface inside for a long time as during the usual heat treatment of products. Ability to control these processes ideally means air binder on the basis of which low strength and water resistance concrete is received, as well as to transform it into hydraulic, more durable and water resistant.

Our task is to introduce a substance, changing thermodynamic characteristics of a system, into the system of these processes, and to obtain new formations, increasing strength and water resistance of concrete with the lime binder. Such substance does not need to be active, as environment (alkalinity, temperature, heat), into which it is introduced and which activates it, is active. Two main requirements are as follows: the substance must be highly soluble in water, and water solution must have sufficient homogeneity of its distribution, and energy of its interatomic bonds must be higher than the energy of interatomic bonds  $\text{CaO}$  ( $\text{CaO}$  is about  $1062 \text{ kJ/mol}$ ) and  $\text{H}_2\text{O}$  ( $\text{H-O}$  is about  $459 \text{ kJ/mol}$ ). Water solution of a chosen substance must extinguish lump lime. Silicon atom with the bond energy  $\text{Si-O}$  of  $1861 \text{ kJ/mol}$  corresponds to these requirements. It is widely spread: organosilicon liquids, aqueous solutions of sodium silicate, sodium fluorosilicate etc.

In our work we used sodium waterglass,  $\text{Na}_2\text{SiO}_3$ , as water modifier. It gives strong alkaline medium [2] and acidified  $\text{SiO}_2$ :

$\text{Na}_2\text{SiO}_3 + \text{H}_2\text{O} = 2\text{NaOH} + \text{SiO}_2$ . Its concentration in water changes the degree of ionization (according to data of electrical resistivity) and pH medium, fig. 1a. Changing its concentration it is also possible to regulate speed of lime slaking, fig. 1b.

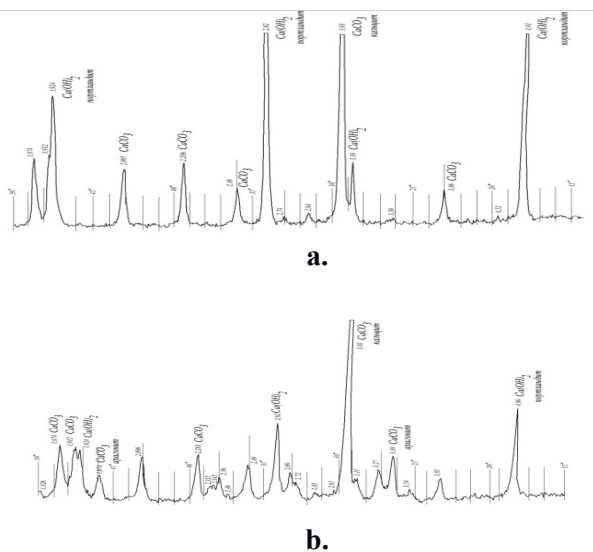


**Figure 1.** Influence of concentration of water solution on the values: a) pH medium (x) and its electrical resistance (•) and b) change of speed of hydration while slaking lump lime with water (the upper curve), water solution with concentration of 1% (medium) and 3% (the low curve).

Due to this fact the structure of control and studied limestones, having solidified for 4 months, was examined. Control samples were prepared on the basis of lime putty received after slaking the lump lime with water. Examined samples, as opposed to the control ones, were prepared with the use of analogue putty, but it was received by slaking

lump lime with water solution of waterglass with the concentration of 6%. Analysis of advantages and disadvantages of examined material was compared with analogue control samples. X-ray analysis was carried out with the use of diffractometer, X-ray DRON-4.0.

Quality phase analysis was carried out by comparison with tabular data about interplanar spacings and their intensity received when interpreting the diffraction patterns, fig. 2. Reliability of identification of a phase is provided by the coincidence of not less than its three the most intensive line on diffraction patterns. Diffraction patterns in the interval of angles from 5 to 65° were taken in researches. Diffraction patterns with saturated number of new forms in the range of angles rotation of 15-50° were chosen for analysis. It let us determine the kinds and quality of new forms. New forms appeared in the control samples: portlandite Ca(OH)<sub>2</sub> and calcite CaCO<sub>3</sub>, fig. 2a. Moreover, the new substance, the aragonite, appears in examined samples, fig. 2b.



**Figure 2.** Diffraction patterns of new forms of a stone, prepared from a lime slaked with water (a) and water solution of waterglass (b).

Qualitative and quantitative composition of new forms as the minerals are given in Table 1. Here lime binder in the form of Ca(OH)<sub>2</sub> is considered as an unreacted substance, and portlandite having the chemical formula also in the

**Table 1.** Qualitative and quantitative composition of new forms of limestone.

Lime slaking	Kind and number of new forms			
	Calcite	Arago-nite	Portlan-dite	Ca(OH) <sub>2</sub>
With water	8	—	3	2
With solution	11	2	1	4

form of Ca(OH)<sub>2</sub>, but having brucite structure of flat sheets with a dense hexagonal packing strength up to 3,5 MPa [3], is considered as solid substance. The distinguishing feature is such that modification of water with waterglass changes its ratio, namely, while slaking with water the number of portlandite is higher, and with water solution of waterglass the number of Ca(OH)<sub>2</sub> is higher.

The effectiveness of water modification for slaking lime is noticeable and 1,6 times higher than occurrence of calcite. But the most important thing is such that slaking of lump lime with water solution of waterglass and its further mixing with water let us obtain limestone, in which composition the new substance, aragonite, appeared. This fact corresponds to literature data[4], according to which its characteristics were determined, and, in comparison with traditional new formation, calcite, is indicated in the Table 2.

**Table 2.** Distinguishing features of new formations of lime binder.

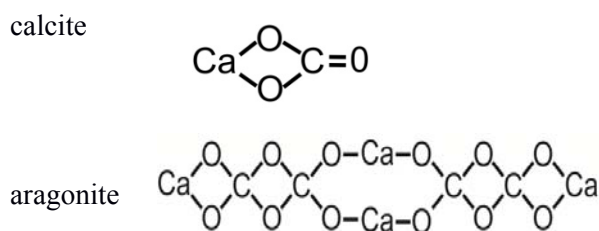
Description of qualities	Calcite	Aragonite
Chemical formyla	CaCO <sub>3</sub>	4[CaCO <sub>3</sub> ]
Density, g/cm <sup>3</sup>	2,71	2,95
Firmness	2,7 – 3,2	3,5 – 4,0
Crystal structure	Cubic	Rhombic

Comparing with calcite, density of aragonite is 9% higher, and firmness is 25-30% higher [4]. It is known that reducing of porosity (increasing of density) of 1% leads to increasing concrete strength of 5%. Taking into consideration the importance of these numbers, it's possible to understand the actuality of work, especially in the part of these processes control.

Quantitative difference in atomic content of crystals of calcite and aragonite causes certain changes in energy potential of interatomic bonds. Chemical formula of aragonite, including four crystals of CaCO<sub>3</sub>, like single solid body, has separation surfaces almost 4 times smaller than the sum of separation surfaces of 4 single crystals of calcite. This advantage is to increase the density of concrete, as it is determined by the density of limestone, filler and their contact, and the contact here is on the molecular level.

Qualitative characteristics of aragonite were studied using its structural formula, which we have developed and shown in Fig. 3.

Structure of aragonite is similar to the structure of calcite. Aragonite was obtained in an environment characterized by a high degree of alkalinity, high temperature and acidic SiO<sub>2</sub>. Due to combination of there parameters the new



**Figure 3.** Structural formula of new formations.

environment appears. It is favorable for isomorphism  $\text{CaCO}_3$ , due to which aragonite appears. Its structural formula indicates the “linking” of four crystals  $\text{CaCO}_3$ , which confirms a hypothesis developed by us. In our researches waterglass  $\text{Na}_2\text{SiO}_3$  with strong binding energy Si–O and increased alkaline medium, cleaves double rigid connection C=O, fig. 2, in crystals  $\text{CaCO}_3$ , which leads to isomorphism, i.e. creation of mixed group compounds of calcite crystals.

We know that the higher the value of the interatomic bonds, the shorter the length of interatomic bonds, the denser the rigid body and the stronger it is. That is why it is important to compare thermodynamic characteristics of aragonite and calcite. The calculation of the energy of interatomic bonds of minerals of solidified lime binder is given in Table 3.

Total energy of interatomic bonds of aragonite crystals is 176 kJ/mol, i.e. 1% higher, than the one of calcite. This energy is high enough, considering that 1 g/mol of quicklime at slaking generates 65,5 kJ of heat which is sufficient for increasing of environment temperature above  $100^\circ\text{C}$ . Moreover, in accordance with the data of X-ray diffraction analysis total energy of interatomic bonds of all new appeared formations, having other constant parameters, is 1,9 times higher (89672 against 47014 kJ/mol) when lump lime is slaked with water solution of waterglass, not with water.

In the case of stabilization or hybridization of energy of interatomic bonds in new formations 1 bond in average has (4014:60=783,6 kJ/mol) at slaking of lime with water and (89672:123= 729 kJ/mol) at slaking with water solution of waterglass.

Thus, slaking of lump lime with water solution of active substances causes isomorphism of  $\text{CaCO}_3$ : in our case to formation of mixed group polymorphic compounds of calcite crystals in the form of aragonite with the best physical and mechanical qualities. Structural formula of aragonite was developed. Working hypothesis was confirmed. Total energy of interatomic bonds of new formations with aragonite is 1,9 times higher than with calcite only. Secondary “raw material” in

**Table 3.** The calculation of the total energy of the interatomic bonds of new formations of lime binder.

Description of minerals	Interatomic bonds		Number, pcs		The total energy of bonds kJ/mol
	Kind	energy, kJ/mol	Kinds of bonds	Minerals	
<b>Slaking of lump lime with water</b>					
$\text{Ca(OH)}_2$	Ca-O	1140	2	5	11400
	H-O	459	2	5	4590
<b>Total energy of interatomic bonds <math>\text{Ca(OH)}_2</math></b>					15990
$\text{Ca(CO)}_3$	Ca-O	1184	2	8	18944
	C-O	383	2	8	6128
	C=O	744	1	8	5952
<b>Total energy of interatomic bonds of calcite</b>					31024
<b>Total energy of interatomic bonds of new formations</b>					47014
<b>Slaking of lump lime with water solution of waterglass</b>					
$\text{Ca(OH)}_2$				5	15990
$\text{Ca(CO)}_3$				11	42658
$4[\text{Ca(CO)}_3]$	Ca-O	1184	8	2	18944
	C-O	383	16	2	12256
<b>Total energy of interatomic bonds of aragonite</b>					31200
<b>Total energy of interatomic bonds of new formations</b>					89672

the form of high heat effect of slaking lump lime and alkalinity, which medium is favourable for polymorphism of reactants, was used rationally.

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