



# SCIENTIFIC ISRAEL – TECHNOLOGICAL ADVANTAGES

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Том 19, № 1

## Аннотации некоторых статей

O.Figovsky, **Nonisocyanate Polyurethanes and Prospects of their Implementation**  
O.Birukova, **in Industrial Production**  
L.Shapovalov,  
A. Trossman

The article is devoted to an actual problem of reducing of toxicity of polyurethanes and the prospects for their replacement by nonisocyanate polyurethanes. The main objective of studies in Polymate Ltd. - International Nanotechnology Research Centre - synthesis of nonisocyanate polyurethanes (NIPU), revealing their application properties and the development of recommendations for the development of their industrial production. The article summarizes the results of the synthesis and complex research of properties of nonisocyanate polyurethanes and hybrid compositions. It describes the characteristics of dependence of the properties of nonisocyanate polyurethanes (NIPU) and urethane-containing epoxy polymers (HNIPU) from the component composition and the presence of urethane-containing modifiers. Based on these studies, presented here examples of possible industrial production NIPU, their

characteristics of mechanical and chemical resistance, and other important parameters. The article sums up the research on the issue of replacement of existing isocyanate polyurethanes by nonisocyanate polyurethanes, and identifies promising areas of application of research results in industry.

E. Dolci1,      **Thermoresponsive Isocyanate-Free Polyurethanes Synthesized by Diels-Alder**  
G. Michaud,   **Polyaddition**  
F. Simon,  
S. Fouquay,  
R. Auvergne,  
S. Caillol1

This new study is a continuation of our previous work on thermocleavable non-isocyanate polyurethanes (NIPUs), but with a reverse synthesis in order to optimize NIPUs conversion. A bis-furanic hydroxyurethane monomer was synthesized and polymerized with a PPO-bismaleimide in order to yield a thermoresponsive non isocyanate polyurethane (NIPU). Firstly, the reactivity of furfuryl cyclocarbonate ether (FCE) toward primary amine was investigated, and the reaction product was characterized by <sup>1</sup>H-NMR. Then, a bisfuranic hydroxyurethane monomer was synthesized by reaction between FCE and ethylenedioxy(bis(ethylamine)) in bulk, to full conversion. The thermal behavior of this monomer was studied by thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). The bisfuranic monomer was then polymerized by Diels-Alder (DA) polyaddition with a bismaleimide oligomer. The thermal behavior of synthesized polymer was fully characterized by three complementary analyses. By DSC, retro-Diels-Alder (rDA) temperatures could be measured at 90-130°C. By <sup>1</sup>H-NMR at 100°C, 95% of the adducts are deprotected after 30mn. Finally, by SEC, it was demonstrated that the obtained NIPU polymer chain is sliced up by rDA reaction.

E. Gotlib ,      **Epoxyurethane Foams**  
E. Cherezova ,  
D. Miloslavsky ,  
K.Medvedeva ,  
D. Sadykova

It was found that the use of polyaminoalkilphenols allows to produce foamed epoxy materials without of the traditional foaming agents. The reaction between epoxy oligomers and amines is exothermic , for this reason the aminophenol hardener is capable «in situ» polymerization to exude the volatile products, foaming a polymer, in case of the equimolecular ratio of functional groups. The combined use of the epoxy oligomers and cyclocarbonates leads to a more uniform distribution of pores of the foamed polymer and decrease of their size.



Том 19, № 2

### Аннотации некоторых статей

#### M. Ioelovich, **Effect of Lattice Distortions on Crystalline Structure of CI**

Impact of lattice distortions on parameters and packing density of crystalline unit cell of various cellulose samples has been studied. It was disclosed that decrease of the degree of paracrystallinity leads to reduction of parameters “a”, “b” and specific volume of C1 with decrease in the degree of paracrystallinity. Using the specific volume of undistorted equilibrium lattice of CI and specific volume of paracrystalline lattice, the degree of distortion of crystalline lattice of various cellulose samples was evaluated. The results showed that large crystallites of tunicate cellulose have a little distorted monoclinic crystalline structure, while monoclinic lattice of smaller crystallites of cotton linter, bast fibers and wood cellulose is more distorted. Triclinic lattice of CI $\alpha$  celluloses was highly distorted. However, paracrystalline distortions in large crystallites of algal or bacterial celluloses are negligible, therefore a high imperfection of CI $\alpha$  lattice is caused by other defects such as vacancies, dislocations, etc. As a result of annealing of CI $\alpha$  celluloses, most of these defects disappear that leads to decrease in distortion degree and conversion of unstable triclinic into stable monoclinic lattice with a higher packing density.

□ unit cell. Par

N.I. Bogdanovich, **Magnetosusceptible Adsorbents Obtained by Thermochemical Activation**  
M.A. Arkhilin,  
A.A. Menshina,  
L.N. Kuznetsova,  
A.V. Kanarskii,  
V.M. Mukhin ,  
N.L. Voropaeva ,  
V.V. Karpachev

Magnetosusceptible adsorbents (MSA) were obtained by method of thermochemical activation of lignin and precipitated on its surface iron (III) hydroxide. Dependence of parameters of magnetic susceptibility and porous structure parameters were investigated. Optimal conditions of synthesis for output parameters in determined interval of factors variation were found. Structural characteristics of MSA were compared with industrial activated carbon BAU-A and OU-B. It was demonstrated, that pores volume of MSA doesn't inferior to values for the activated carbons.

P.Kudryavtsev **Heat-Resistant Inorganic Binders**

This paper discusses methods for producing of heat-resistant inorganic composite materials, using new classes of inorganic binders, which are the basic salts of various metals. There is demonstrated the possibility of using hydroxo-chlorides and hydroxo-nitrates of aluminum, zirconium, chromium and other metals as binder. The main products of the thermal decomposition of all types of binders discussed in this paper are nanodispersed high-refractory oxides.

M. Belloni , **The Need for Changes in Electric Distribution Network for the Use of the Mini**  
T. das Neves Conti **and Micro on Grid Generators**

It is expected that with the diversification of utilization rates, the increased demand for electricity and the difficulties encountered in hydroelectric generation, promote the acquisition of more renewable energy generators connected to the network. There's no way to keep a nationwide system of interconnected components and mini-generation connected to the network, effectively without the deployment of the smart grid. Through studies carried out in some inverters used in solar generators, it was verified the existence of harmonics that are injected in the distribution network, creating fluctuations of voltage and current. Rectification of the sine wave inverter, and the connection of multiple network generators cause oscillations in both voltage and frequency, making necessary a network that not only identify these fluctuations, but to interpret, going further, as should take measures to mitigate the effects of these oscillations. This requires an intelligent, interconnected network to the central data processing, intuitive and with a certain degree of autonomy, reducing response time to problems, directing and compensating voltage spikes and rectifying the quality of electricity injected by miscellaneous generators connected to the same

E.G. Shahbazov, **Nanosystem Preventing Complications in Oil And Gas Production**  
R.A.Yusifov,  
K.Sh. Jabbarova,  
Kh.Kh. Huseynli

The article was dedicated to the nanosystem application having synergistic effect developed on the basis of "low impact and excitation" effect for asphaltene-resin-paraffin (ARP) deposits prevention causing technological complications during the oil production and transportation. The nanosystem made on the basis of organic solvent, surface active substances (SAA) and metal nanoparticle simplifies the oil production, prevents mechanical mixtures in oil well equipment, solves the mixtures on down-hole zone

and pipe, and decreases oil viscosity. Time between overhauls and oil production increased as the result of nanosystem application at the well № 1331 Palchig pilpile field of "Oil Rocks" OGPД, and great economic benefits were achieved.

**A. Beylin      Technical Principles of Simultaneous White Light and 5-Ala-Induced Fluorescent Imaging for Real-Time Microsurgical Resection of Malignant Gliomas**

Administration of 5-aminolaevulinic acid (5-ALA), a natural metabolic precursor of haem results in selective accumulation of protoporphyrin-IX (PpIX) in malignant glioma tissue. Fluorescent imaging of PpIX has been used for rapid intraoperative identification of tumors enabling more complete and accurate tumor removal. In the standard fluorescence detection mode, the surgeon switches the light source coupled with an operating microscope from the normal white light to the violet-blue excitation light ( $375\pm440$  nm) and observes PpIX fluorescence through a longpass filter, introduced into the optical path of the microscope. Although violet-blue illumination reveals the fluorescent areas, it hides the anatomical details of the tissue, and the continuous flow of the surgical procedure is interrupted. In the present study, we report a new imaging technology which permits visualization of tumor fluorescence in the presence of intensive broad-band microscope illumination which allows the surgeon to discriminate visually brain tissue from tumor, and to perform surgery without interruption or delay for tissue identification. The system does not require any modifications of the microscope optics or light source and can easily be adapted to any type of surgical microscope. The weak fluorescence of tumor tissue is acquired by the imaging system, processed in real time and presented as a high contrast synthetic image to be introduced into the visual pathway of the microscope. Also, the fluorescent image is superimposed with true color background image and saved for documenting and archiving purposes. The current technology has been tested in three cases of human malignant glioma and demonstrated reliable recognition of tumor fluorescence signals in the presence of the typical level of background illumination. The system facilitated the intraoperative discrimination of malignant glioma tissue

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