

**Vol. 11, No. 1, 2017**

A simultaneous English language translation of this journal is available from Pleiades Publishing, Ltd.  
Distributed worldwide by Springer. *Russian Journal of Physical Chemistry B* ISSN 1990-7931.

## Elementary Physicochemical Processes

Variation of Potential Energy Surface Height and Bound State Depth Induced  
by Laser Phase Along the Reaction Path in Atom-Molecule Reactions:  
Application to  $\text{Li} + \text{CH}_4 \rightarrow \text{LiH} + \text{CH}_3$

*Hassan Talaat, El-Wallid S. Sedik, and M. Tag El-Din Kamal* 1

Electron and Multiphoton Ionization of Xenon\*

*A. A. Mityureva, A. A. Pastor, K. V. Pavlov, P. Yu. Serdobintsev, and N. A. Timofeev* 9

Evaluation of the Probability of Hydrogen Atoms Photoionization  
in a Strong Ultrashort Laser Field Using the Trajectory Method\*

*A. S. Kozhina and V. V. Smirnov* 12

Absorption of Electromagnetic Radiation in Systems with Orientational Interactions\*

*O. G. Maksimova and A. V. Maksimov* 15

Heterogeneous Relaxation of Vibrationally Excited  $\text{CO}(X^1\Sigma, v = 4, 5)$  Molecules\*

*G. M. Grigorian and T. L. Tkachenko* 20

Threshold Dependence of the Vibrational Excitation of Molecules  
on Laser Radiation Intensity\*

*G. Yu. Grigor'ev, L. I. Men'shikov, P. L. Men'shikov, and Sh. Sh. Nabiev* 24

Low-Energy Inelastic Atomic Collisions of Magnesium and Hydrogen\*

*D. S. Rodionov and A. K. Belyaev* 34

## Structure of Chemical Compounds. Spectroscopy

Structure of Complexes in the  $\text{H}_2\text{SO}_4$ —2-Pyrrolidone System as Determined  
by IR-Spectroscopy and Quantum-Chemical Calculations

*V. D. Maiorov, I. S. Kislina, and E. G. Tarakanova* 37

On the Possibility of Determining the Structure of Proteins in Experiments  
Using X-Ray Free Electron Lasers in the Nonstationary Scattering Mode

*D. O. Sinitsyn and G. A. Armeev* 49

Nonlinear Comb Spectroscopy

*A. S. Sumarokov, S. V. Uvarova, A. G. Antipov, S. V. Savel'eva, and S. A. Pul'kin* 59

Measurements of the Isotopic Composition of  $\text{UF}_6$  According to the Fine Structure  
of the IR Absorption Spectrum in the  $\nu_1 + \nu_3$  Band

*Sh. Sh. Nabiev, V. M. Semenov, D. B. Stavrovskii,  
P. L. Men'shikov, L. I. Men'shikov, and G. Yu. Grigor'ev* 61

Potential Energy Surface of the Rydberg States of the NO Molecule  
in an Intense IR Radiation Field

*N. S. Malyshev, V. V. Kuverova, G. K. Ozerov, G. V. Golubkov,  
M. G. Golubkov, and S. O. Adamson* 77

## **Influence of External Factors on the Physicochemical Transformations**

Broadband Infrared Photoluminescence of TlCdI<sub>3</sub> Iodide Doped with Bismuth

*A. N. Romanov, D. N. Vtyurina, E. V. Haula, D. P. Shashkin,  
N. A. Pimkin, M. S. Kuznetsov, I. S. Lisitsky, and V. N. Korchak*

83

Formation of Silver Nanoparticles with Dielectric Shell on the Silver-Containing Glass during Laser Evaporation and Ablation\*

*V. I. Egorov, I. V. Zviagin, D. A. Kliukin, and A. I. Sidorov*

87

Plasma-Chemical Processes with the Participation of Nitrogen in the Active Medium of a Sealed-off CO Laser\*

*G. M. Grigorian and A. Cenian*

89

Lasers in Analysis: Potential and Prospects for the Development of Ultrashort Pulsed Lasers\*

*V. M. Nemets and A. A. Pastor*

95

Contraction of the Positive Column of a Glow Discharge in Inert Gases with Account of Resonance Radiation Transport\*

*Yu. B. Golubovskii, V. O. Nekuchaev, and A. V. Syasko*

99

Diffusion-Path Approximation in Nonlocal Electron Kinetics\*

*Yu. B. Golubovskii, K. M. Rabadanov, and V. O. Nekuchaev*

106

Theoretical Study of the Effect of Temperature Differential and Ionizing Radiation on the Current–Voltage Characteristics of HEM Transistors\*

*A. G. Gudkov, V. G. Tikhomirov, B. R. Shub, and S. I. Vidyakin*

112

Effects of Graphite Intercalation with Cesium in a Thermionic Converter\*

*A. S. Mustafaev, V. A. Polishchuk, A. B. Tsyganov, V. I. Yarygin, and P. A. Petrov*

118

---

## **Kinetics and Mechanism of Chemical Reactions. Catalysis**

Synthesis, Characterization and Gelation Mechanism of L-Phenylalanine-Based Dihydrazide Derivative as Excellent Gelator

*Y. Yu, N. Chu, X. Y. Li, N. Song, C. Liu, L. N. Yu, B. Li, C. Wang,  
Z. G. Zhao, Y. N. Zhao, Y. G. Sheng, and C. S. Wang*

121

Kinetic Models of Cyclohexene Hydrocarbomethoxylation Catalyzed by the Pd(PPh<sub>3</sub>)<sub>2</sub>Cl<sub>2</sub>–PPh<sub>3</sub>–*p*-Toluenesulfonic Acid System

*N. T. Sevostyanova, A. M. Demerlii, and S. A. Batashev*

129

---

## **Combustion, Explosion, and Shock Waves**

Calculation of the Characteristics of the Ignition of a Metallized Composite Propellant Using Various Methods for Describing Its Thermophysical Properties

*D. O. Glushkov, G. V. Kuznetsov, and P. A. Strizhak*

133

---

## **Chemical Physics of Biological Processes**

The Mechanism of the Interaction between Curcumin and Bovine Serum Albumin Using Fluorescence Spectrum

*Changchun Hao, Guoqing Xu, Tianyue Wang, Zhanshan Lv,  
Kaixuan Zhu, Bin Li, Shi Chen, and Runguang Sun*

140

Physicochemical Modeling of the Main Stages of Formation of a Chirally Pure Prebiotic World

*Ya. A. Litvin, A. A. Skoblin, and S. V. Stovbun*

146

## Chemical Physics of Ecological Processes

Dynamic Adsorption of Nitrogen Dioxide on Zeolites

*I. V. Kumpanenko, A. V. Roshchin, N. A. Ivanova, V. V. Novikov,  
A. M. Skryl'nikov, A. M. Podvalny, and V. V. Usin*

154

---

## Chemical Physics of Polymer Materials

Kinetics of the Thermal Polymerization of Styrene in Stretched Polytetrafluoroethylene Films

*E. F. Abdrashitov, D. A. Kritskaya, V. Ch. Bokun, and A. N. Ponomarev*

167

---

## Chemical Physics of Nanomaterials

Preparation of Copper–Molybdenum Nanocrystalline Pseudoalloys Using a Combination of Mechanical Activation and Spark Plasma Sintering Techniques

*N. F. Shkodich, A. S. Rogachev, A. S. Mukasyan, D. O. Moskovskikh,  
K. V. Kuskov, A. S. Schukin, and N. Yu. Khomenko*

173

---

## Chemical Physics of Atmospheric Phenomena

Kinetics of NO<sub>3</sub> Uptake on a Methane Soot Coating

*V. V. Zelenov, E. V. Aparina, S. A. Kashtanov, and E. V. Shardakova*

180

Contribution from the O<sub>x</sub><sup>-</sup>, HO<sub>x</sub><sup>-</sup>, NO<sub>x</sub><sup>-</sup>, ClO<sub>x</sub><sup>-</sup>, and BrO<sub>x</sub><sup>-</sup>-Cycles to the Stratospheric Ozone Depletion in the XXI Century

*I. K. Larin*

189

---

## Macrokinetics of Complex Physicochemical Phenomena

Potassium Sulfate Forms a Spiral Structure when Dissolved in Solution

*Sunil Thomas*

195

---

---