

System of langmuir films and thermodynamics of structural transitions

*S. I. Valyanskii^{1,2}, S. V. Vinogradov¹, M. A. Kononov¹, I. S. Nedosekina², S. F. Rastopov¹,
and V. V. Savranskii¹*

¹ Prokhorov General Physics Institute of the Russian Academy of Sciences
38 Vavilov st., Moscow, 119991, Russia
E-mail: sergv3@yandex.ru

² National Research Technological University "MISIS"
4 Leninsky st., Moscow, 119049, Russia

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According to the ratio of uncertainty of the microstructure, they cannot be at rest even at zero temperature. The creation of Langmuir films leads to the collective movements of individual piercing molecules, that is, to the creation of wave movements arising in Langmuir films. According to quantum theory, the wave movements of the field can be described as the birth of quasiplayers. The article shows that the presence of wave processes leads to the restructuring of structures created from a set of monolayer of Langmuir films. These processes can be described by examining the stability of such multilayer structures. This article discusses the process of spontaneous violation of symmetry and the possibility of spontaneous structural transitions in Langmuir films. The simple model determines the conditions under which such transitions occur and establish, whether stable states, such as X or Z structures, exist with structural transitions from Y-type of film.

Keywords: langmuir films, wave structures, phase transitions, thermodynamic modeling.

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REFERENCES

1. A. I. Yanklovich, T. A. Kuzmina, and S. R. Toporkov, Vestn. Leningrad. University, No. 10, 79 (1980).
2. A. I. Yanklovich and Yu. M. Chernoberezhsk, Vestn. Leningrad. University, No. 16, 84 (1980).
3. J. B. Peng, B. M. Abraham, and P. Dutta, Thin Sol. Films **134**, 187 (1985).
4. A. Z. Patashinsky and V. L. Pokrovsky, *Flicking theory of phase transition*. (Science, Moscow, 1982).
5. A. S. Alekseev, S. I. Valyansky, and V. V. Savranskii, Proceedings of Jofan, No. 38, 133 (1992).
6. S. Vinogradov and M. Kononov, Proceedings of SPIE – The International Society for Optical Engineering **9486**, 94860Y (2015). DOI: 10.1117/12.2176765.
7. L. D. Landau and E. M. Lifshits, *Statistical physics*. (Science, Moscow, 1976).
8. J.-K. Toledo and P. Toledo, *Theory of Landau Phase transitions*. (Science, Moscow, 1994).
9. L. M. Blinov, UFN **155** (3), 443 (1988).
10. V. M. Kaganer, H. Mohwald, and P. Dutta, Rev. Mod. Phys. **71**, 779 (1999).
11. V. B. Fainerman and D. Vollhardt, J. Phys. Chem. B. **103** (1), 145 (1999).
12. H. M. McConnell, Rev. Phys. Chem. **42** (1), 171 (1991).
13. V. V. Kislov and Yu. A. Krixin, Mathematical modeling **2** (1), 3 (1990).
14. V. V. Kislov and Yu. A. Krixin, Mathematical modeling **2** (4), 39 (1990).
15. V. Shita, W. Richardson, I. Filipkowski, A. Garito, and J. K. Blasié. J. Phys. (Paris) **47**, 1849 (1986).