Generalization of the Van der Waals equation for anisotropic fluids in a disordered porous medium

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We present a generalization of the Van der Waals equation of state for anisotropic fluids in a disordered porous medium. The generalized equation consists of two terms. The first of them is based on the equation of state for hard spherocylinders in random porous media obtained from the scaled particle theory and improved by Carnahan–Starling and Parson–Lee corrections [1]. The second term is expressed in terms of the mean value of anisotropic attractive interactions. The proposed generalized van der Waals equation is used for investigation of the gas-liquid-nematic phase behaviour of a molecular anisotropic fluids depending on the anisotropy of molecular shapes, the anisotropy of attractive intermolecular interactions and the porosity of porous medium [2]. It is shown that for sufficiently long spherocylinders the liquid-gas transition is located completely within the nematic region and leads to nematic-nematic phase separation. For all the considered cases the decrease of porosity shifts the phase diagram to the region of lower densities and lower temperature. The proposed generalization of the van der Waals equation is applied for description of the phase behaviour of solutions of a relatively rigid polypeptide, poly(γ-benzyl-*L*-glutamate) (PBLG), in dimethylformamide in porous media. A quantitative description of the experimental isotropic-nematic phase behaviour of the PBLG solutions is achieved using two temperature-dependent parameters. Some possible modifications of the phase behaviour by porous media are predicted [3].

1. M.F. Holovko, V.I. Shmotolokha, Cond. Matter Phys., 2018, **21**, 13602.
2. M.F. Holovko, V.I. Shmotolokha, Ukr. J. Phys., 2015, **60**, 770.
3. V. Shmotolokha, M. Holovko (in preparation).