Electrolyte–Electrolyte Phase Separation in a DC Magnetic Field

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In recent years, the attention of researchers in the physics of magnetic phenomena is devoted to the study of processes occurring at the ferromagnet-electrolyte interfaces [1-5]. Specifically, the course of these processes depends on both the gradient of magnetic field and its distribution on the electrodes surface according to [3]. The formation of etching or deposition patterns on the surface of ferromagnetic specimens were observed in the series of experimental studies [4]. These processes are accompanied by nonhomogeneous motion of the electrolyte around the surface of the electrodes. Such effects can be explained by the electrolyte clustering in the ferromagnetic electrodes stray magnetic fields.

In accordance with the results we can assume that the presence of the electrolyte-electrolyte phase states in a stray magnetic field of the ferromagnetic electrode is the reason for self-assembled structures formation and essentially influences on the electrochemical processes. The correlations between the electrode surface structure, electrolyte structure, dynamic characteristics of the electrolyte motion and clusters sizes were specified.

The theoretical model that describes the shape of the interphase surface in the crossed magnetic and gravitational fields was developed on the basis of the hydrostatic equilibrium equation. It takes into account the magnetic, osmotic, gravitational, Laplace and centrifugal force pressures that cause rotation of the electrolyte near the surface of the magnetized electrode.

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