

Diffusion in nano-porous media

D. V. Portnyagin

*Institute for condensed matter physics NAS of Ukraine, Svietsitskii street 1, 79011
LVIV, Ukraine E-mail: port@icmp.lviv.ua*

In this presentation we discuss several aspects of the transport of lithium ions (intercalation) across nano-porous carbon material. It is well-known that nano-porous carbon or fine carbon fiber proved a perspective material for anode (negative electrode) in high-density energy storage devices. The affix "nano-" indicates that the size of pores is comparable with the size of molecules. The discrepancy between experimentally obtained cyclic voltamograms and discharge curves and computer simulated ones has been ascribed to the effect of gluing up of micro-particles of anode. The gluing up of specks of fine powder occurs due to the application of alternative external electro-magnetic field, in much the same way as in the first coherer at the dawn of radio era, which in a lithium cell corresponds to the change of spherical symmetry to cylindrical one. The jump of applied external electric field must exceed thermal fluctuations to produce the effect within the framework of classical physics. Theoretically this is treated as ponderomotive force. On the basis of electrocapillarity phenomenon this approach has been utilized to explain intercalation (intrusion, diffusion through solid medium) proper.