Nanocomposites and nanomaterials

Nanostructed organic-inorganic films for application in fuel cells

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Creation of nanocomposite materials on the base of hybrid organic-inorganic systems is one of the perspective directions of nanochemistry [1]. Nanocomposite organic-inorganic materials find increasing application in technique, in particular, as membranes for fuel cells, which are environment-friendly and attractive energy sources [2-3].

Nanostructed organic-inorganic films were synthesized by photoinitiated polymerization of acrylate composition (acrylonitrile, acrylamide and 3-sulfopropyl acrylate) in the presence of sol-gel system on the basis of tetraethoxysilane (TEOS) and 3-glycidoxypropyltrimethoxysilane (GPS). At the process of photoinitiated polymerization sol-gel conversion (hydrolysis of tetraethoxysilane followed by condensation of silanol groups) takes place simultaneously with the process of formation of polymer chains: as a result hybrid organic-inorganic nanostructure was formed. Cross-linker *N*,*N'*-methylenbisacryamide was used to form cross-linked structure of the material.

Proton conductivity of obtained materials, determined by impedance spectroscopy, was found to be ~ 10^{-4} S/cm. Synthesized materials can be recommended for further investigation to develop proton-conductive membranes for methanol fuel cells.

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2. *Laberty-Rober C., Vallé K, Pereira F., Sanchez C.* Design and properties of functional hybrid organic–inorganic membranes for fuel cells // Chem. Soc. Rev. – 2011. – **40**. – P. 961-1005.