Li-CONTAINING SOLID POLYMERIC ELECTROLYTES BASED ON ALKYLMETHACRYLATES

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For improving of physico-mechanical and conducting properties of solid polymeric electrolytes (SPE) the modelling synthesis of carbon-chain copolymers with different monomers ratios was carried out. Binar copolymers of butyl methacrylate (BMA), octyl methacrylate (OMA), β-chloroethyl methacrylate (CEMA) with butyl vinyl ether (BVE), acrylonitrile (AN) and β- chloroethyl vinyl ether (CVE) were obtained. These copolymers were purified and characterized.

Copolymers were doped by different concentrations (3 ÷ 42 mol.%) of $LiClO_4$. Obtained films were studied by dielectrical method in wide temperature-frequency ranges, which allowed to find complex formations between Li-cation and oxygen atom in ethers or nitrogen atom in acrylonitrile [1-2]. Such dielectrical parameters as dielectric constant ε', dielectric loss tgδ, effective conductivity σ_{ef} and $T_{tg\delta\ max}$, were calculated in dependence on compositions of copolymers and salt concentrations.

For the matrix BMA-BVE an introduction of 12 mol.% of $LiClO_4$ was shown to cause a decrease of the intensity of dipole-segmental relaxation due to coordination bond formation between Li^+ cation and oxygen atom of BVE. For the matrix BMA-CVE with 3,5 mol. % of $LiClO_4$ the complex formation is proved by the shift of dipole-segmental relaxation range to higher temperatures, but $tg\delta_{max}$ almost aren't changed. At high concentrations (27 and 42 mol.%) of $LiClO_4$ Li^+ cations unconnected by coordination interaction with ether oxyden are charge carriers and cause high values of $tg\delta_{max,}$ ε', ε''. On the introduction of $LiClO_4$ in copolymer-matrix CEMA-BVE in amounts 3-40 mol.% the process of dipole-segmental relaxation can't be realized because it is covered by higher conductivity. These copolymers films have higher ε' and tgδ at increasing of temperature and Li content.

From dielectrical measurements the effective conductivity σ_{ef} was calculated for doped copolymers-matrixes of different compositions. For SPE based on BMA-CVE and BMA-BVE $\sigma_{ef.}$ values are 10^{-5}-$0{,}5\cdot10^{-4}$ S/cm. The ionic conductivity for these SPE measured by the impedance method at room temperature and 10 kHz is close to calculated σ_{ef} and it is $0{,}5\cdot10^{-4}$-10^{-6} S/cm.

[1] L.Paskal, L.Lynets, V.Syromyatnikov, T.Butmerchuk. Functional materials, 7, №4, 659 (2000).

[2] L.Paskal, L.Lynets, V.Syromyatnikov, V.Dusheiko. Solid State Ionics, 147, 383-390 (2002).