

Characterisation and application of semi-solid electrolytes with various co-solvents for electrochromic devices

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ABSTRACT

The organic-inorganic hybrid materials^[1] emerged with the introduction of “soft” inorganic chemistry routes allowing low-temperature processing and chemical design, leading to materials that combine unique properties of both materials, i.e. flexibility of organic and hardness of inorganic phase. Accordingly, bis N-triethoxysilyl propylcarbamatoil PEO 400^[1] (PEOCS) was synthesised aiming to investigate its performance as a semi solid electrolyte for the electrochromic (EC) devices. The silylated precursor enabled hydrolysis (solvolysis) and condensation reactions which led to the formation of branched polysilsesquioxane (P-SQ) structure, checked from the measured ²⁹Si NMR and infrared spectra. The network formed was capable of the accommodation a large amount of co-solvent and the dissolution of various lithium salts. The conductivity of the formed P-SQ network was 10⁻⁸ S/cm but increase to 10⁻⁵ S/cm with the added LiTFSI and further increased to 10⁻³ S/cm after the addition of co-solvent. Various co-solvents were tested: N-methyl-2-pyrrolidone, γ -butyrolactone, sulfolane and alkyl-functionalised mesylate ionic liquid. The electrolytes were used for constructing EC devices with optically active PEDOT electrode and various inorganic counter electrodes (V₂O₅, Sn/Mo-oxide,...) with satisfactory results.

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REFERENCES

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