

Photopatternable Phosphonium/Imidazolium Ionogels for electrochromic applications.

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One of our research interests is the use of Ionic Liquids (IL's) as sensorial and actuating materials within polymeric supports, so called *Ionogels*¹⁻³. We now aim to highlight our recent research into the use of IL's in solid state electrochromic device fabrications. The polymeric support for this work comes in the form of the hybrid organic-inorganic sol-gel material; which when photopolymerized with phosphonium and imidazolium based IL's forms the basis of directly *Photopatternable Ionogels*.

Photopatterning was performed using 2-photon polymerisation, a technique which allowed the formation of three-dimensional woodpile structures with sub-micron resolution.

The ionogels also exhibit a measured ionic conductivity which facilitates their use as a solid state electrolyte when doped with an electrochromic *Viologen* dye. Characterisation includes electrochemical impedance and raman spectroscopy; whilst the ionogels also exhibited the reversible one electron transfer optical equilibria classical of viologen based devices. Subsequent characterisation of these equilibria was performed via spectroelectrochemistry where reduction via an applied potential generates the blue monoradical cation within the ionogel. We believe these materials have great potential in applications such as photonic devices and flexible conducting substrates.

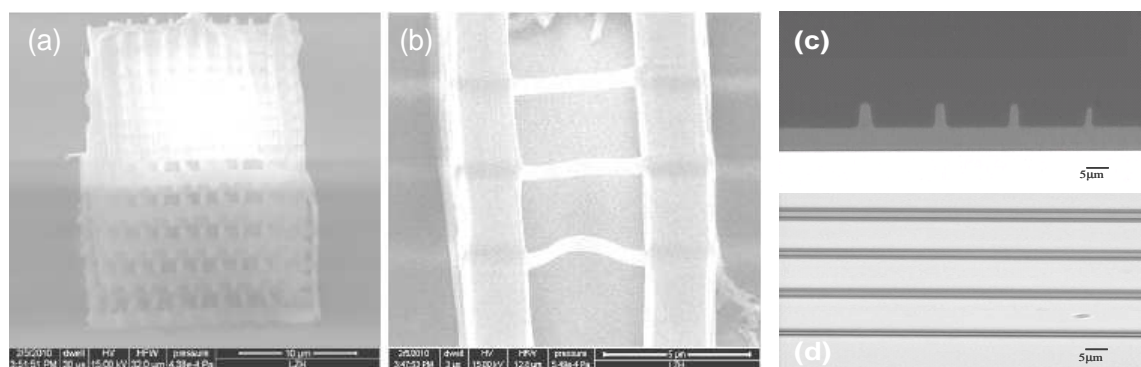


Fig. 1: (a) and (b) SEM images of three-dimensional photonic crystals from SZ4-20wt% [P_{6,6,6,14}][DCA] (c) and (d) Photopatterning of SZ4-20wt% [P_{6,6,6,14}][DCA]

(1) Kavanagh,A. et al; *Analyst*,**2011**, **136**, 348-353.

(2) Yang,S. Y.; Byrne R. et al;*Chemical Communications*,**2010**, **46**, 7972-7974.

(3) Benito-Lopez,F.; Byrne, R. et al; *Lab on a Chip*, **2010**, **10**, 195-201.