

## Understanding ternary poly(potassium benzimidazolid)-based polymer electrolytes - DTU Orbit (08/11/2017)

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Poly(2,20-(m-phenylene)-5,50-bisbenzimidazole) (m-PBI) can dissolve large amounts of aqueous electrolytes to give materials with extraordinary high ion conductivity and the practical applicability has been demonstrated repeatedly in fuel cells, water electrolyzers and as anion conducting component in fuel cell catalyst layers. This work focuses on the chemistry of m-PBI in aqueous potassium hydroxide. Equilibration in aqueous KOH with concentrations of 15e20 wt.% was found to result in ionization of the polymer, causing released intermolecular hydrogen bonding. This allowed for extensive volume swelling, high electrolyte uptake, dramatic plasticization and increase of the ion conductivity for the formed poly(potassium benzimidazolid)-based structure. Further increasing the concentration of the bulk solution to 50 wt.% resulted in dehydration and extensive crystallization of the polymer matrix as evidenced by X-ray diffraction, increased density and enhanced elastic modulus. © 2016 Elsevier Ltd. All rights reserved.

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