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Conceptual Structures of Proton Exchange Membrane-Intended Polysulfone with Tuneable Sulfonic Acid Domains by ”Click” and ATRP

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The current main issues in the field of Proton Exchange Membranes (PEM) for fuel cells (FC) are to obtain better durability and improved performance at >80 ^{o}C at a reduced cost [1]. The proton conductivity of state-of-the-art perfluorosulfonic acid (PFSA) type membranes like Nafion® generally decays at higher temperatures, where the PEMFC system is more efficient [2]. An alternative backbone is the commercially available polysulfone (PSU) Udel® with good chemical, thermal and mechanical as well as film forming properties - the latter is a feature that easily rules otherwise strong candidates out [3]. Proton conductivity is obtained through the introduction of sulfonic acid containing compounds of different structures. The quantitative terminal alkyne-azide “click” reaction facilitates dendron structures, and comb polymers are obtained by the controlled atom transfer radical polymerization (ATRP) (see Figure 1). The Ion Exchange Capacity can easily be tuned when the precursor backbone is well defined. We believe that the principle of introducing proton conductivity to a PSU backbone by sulfonated ”click” dendrons has not earlier been presented.

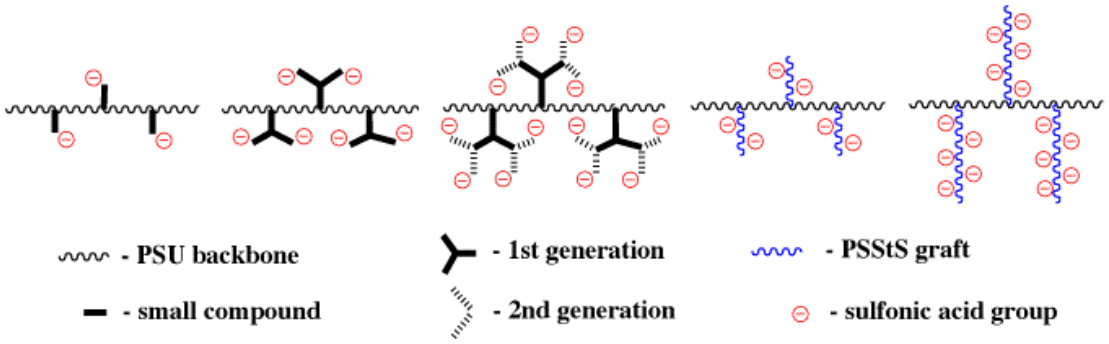

Figure 1. The conceptual structures that can be achieved with ”click” and ATRP.

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