Synthesis and characterization of fluoropolymer membrane using RIG and reversible addition-fragmentation-chain-transfer (RAFT) method for fuel cell application

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Anion exchange fuel cells (AEMFC) have attracted widespread attention in the last years and are considered one of the most promising environmentally friendly power generations. An auspicious way to produce well-controlled structures for applications as anion exchange membrane is using the radiation-induced grafting method (RIG) with RAFT agents [1]. RAFT consists of a reversible addition fragmentation chain transfer of free radicals and allows the control over polymeric molecular weight and copolymer topology and other properties. Ethylene tetrafluoroethylene (ETFE) is a type of fluoropolymer that can be applied in AEM due to its lightweight, excellent chemical and thermodynamic stability, and greater resistance to radiation ageing [2]. In this study, we investigated the beneficial outcomes of performing the ETFE-AEM synthesis in a fully controlled manner by RAFT polymerization using RIG. The influence of RAFT agent on physical (mechanical behavior, dimension), chemical (such as IEC), thermal properties (TGA and DSC) were investigated in detail for future and evaluated in AEMFCs. ETFE-grafting-Vinylbenzyl chloride (VBC) using RAFT agent controlled grafting degree of membrane and improved mechanical properties compared to conventional method of grafting.

Acknowledgements:

This research was funded by SHELL (ANP) and IAEA RC 23708.

References:

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