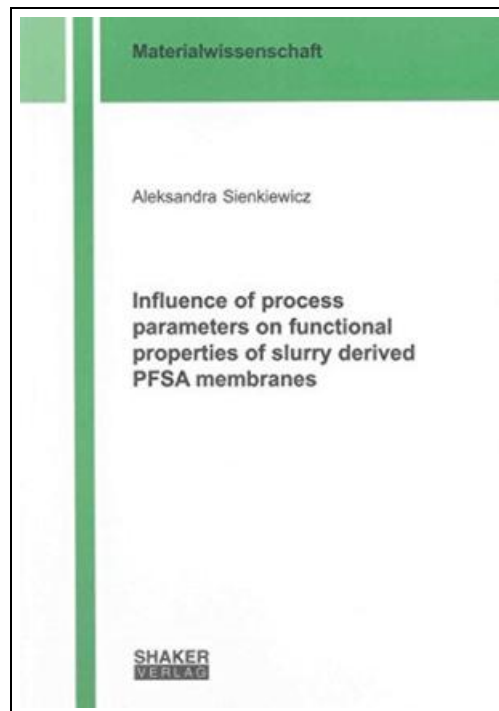


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(Prof. Triston Smitham V)

INFLUENCE OF PROCESS PARAMETERS ON FUNCTIONAL PROPERTIES OF SLURRY DERIVED PFSA MEMBRANES



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Shaker Verlag Mai 2013, 2013. Taschenbuch. Condition: Neu. Neuware - The processing of perfluorosulfonic acid (PFSA) ionomer membranes derived from polymer slurry is the focus of this study. PFSA molecules self-aggregate and form micelles in a slurry as a consequence of its chemical structure. The gradual coalescence of polymer micelles occurs upon membrane formation processes. The particular application of PFSA membranes is proton conducting solid electrolyte for fuel cells, which operate at high temperatures up to 120°C and low relative humidity. The synthesis of PFSA is not a subject of this work. The polymer in a water-alcohol based slurry was provided by 3M Germany for the purpose of a scientific project. The main focus of this study was the characterization of membrane properties derived from a slurry as a consequence of variable process steps. The functional properties of PFSA membrane depend on process conditions. The investigated process parameters were as follows: homogenization and deaeration of PFSA slurry, thermal treatment for drying and annealing, protonation for equilibration of ion content in the membrane. It can be concluded that the process steps influence functional properties of PFSA membrane including mechanical features. Therefore, the physical and chemical aspects of membrane formation were investigated. The following steps were defined as physical aspects: the energy input in the polymer slurry upon homogenization, casting parameters i.e. shear rate at constant humidity and temperature conditions, temperature and humidity during drying and annealing. The chemical features distinguished in processing were as follows: the chemical nature and concentration of ternary solvent, the acids utilized for membrane protonation. The investigation of PFSA slurry parameters was conducted by microscopic and rheological analysis. The variation in size and shape of polymer micelles was studied as a function of ternary solvent and energy input upon homogenization. It was concluded that energy input contributes...



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