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# Mechanically stable nanofibrous sPEEK/Aquivion® composite membranes for fuel cell applications

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ABSTRACT

Nanocomposite proton exchange membranes based on fibrous sulfonated poly(ether ether ketone) (sPEEK) and Aquivion® have been prepared by a two-step procedure involving electrospinning and impregnation. The dependence of their proton conductivity, water uptake, dimensional swelling and mechanical strength on the sulfonation degree of the sPEEK fibers has been determined and compared to a pristine Aquivion® membrane. The preparation of a composite membrane where a highly sulfonated PEEK mat is crosslinked previous to Aquivion® impregnation was also investigated. In all cases, the composite membranes demonstrate a diminution in proton conductivity compared to the non-reinforced membrane, but enhanced mechanical properties and dimensional stability. In particular, the system comprising crosslinked sPEEK presented the best mechanical and swelling behaviors with a lower conductivity loss.

**Keywords:** Proton exchange membrane; nanofibers; electrospinning; composite membranes; sPEEK; Aquivion®



## 1. Introduction

In the continuous advances of proton exchange membrane fuel cells (PEMFCs), the development of the ionomer membrane is crucial for their reliability and high volume

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