

## **Nanocomposites and nanomaterials**

### **Design and characterization of PEM based on xanthan and orthophosphoric acid**

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Fuel cells (FC) are promising energy conversion devices which can directly produce electricity from chemical reaction of reduction/oxidation. Polymer electrolyte membrane (PEM) of FCs are considered as clean environmental friendly efficient power source for diverse applications. To date the most spread commercial PEM are synthetic Fluor-containing polymers, which are not only rather expensive but also are difficult in utilization after usage. Currently, one of the most promising trends in PEM development is using natural polymers, in particular, polysaccharides. In this research xanthan, a polysaccharide of microbial origin was modified with the purpose to obtain bio-based PEM for FC.

The method of chemical modification both of xanthan and xanthan/PVA was developed using the phosphorous anhydride (V) and orthophosphoric acid as modifiers and carbamide as activator. The reaction path was carried out in water solutions to satisfy the demands of green chemistry principles with the small additions of organic solvents. After modification hydrogels gel were obtained and investigated via dielectric and relaxation spectroscopy method. The hydrogels obtained were partially cross-linked and contained additional acidic groups. Results of DRS investigation of modified hydrogels demonstrated considerably high levels of ionic conductivity up to  $1,5 \times 10^{-2}$  Sm/cm which is competitive to commercial samples. These results make the obtained hydrogels prospective as gel polyelectrolyte.