New polymer membranes for bioethanol dehydration

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Polymeric membranes for dehydration of first-generation bioethanol by pervaporation were successfully developed in the past. [1, 2] Today, second and third generation bioethanol is produced from non-food crops (*i.e.* wood, organic waste or specific biomass crops) and contains impurities such as organic acids, furfural, aldehydes *etc*. These impurities deteriorate the material properties when used as membrane in pervaporation. Due to these changes, these materials cannot be used as membrane for dehydration processes of second and third generation bioethanol. Therefore, the focus is particularly on the design and development of new polymeric membrane materials.

The goal of research project is to develop new membrane materials resistant to aldehydes and acids, because they are the most poisonous contaminants for the existing commercial membranes. Synthesis and molecular manipulation of polymer and copolymer systems at nanometer scale are the main routes for developing these membrane materials *i.e.* by synthesis of new (co)polymers and/or development of cross-linking methods for membrane preparation.

For the membrane preparation, synthesis of copolymer systems with various 2-(dimethylamino)ethyl methacrylate and *N*-vinylpyrrolidone is performed by free radical polymerization and the resulting materials are extensively characterized. Different membranes are produced of various blends based on these copolymers. The pH responsive behaviours of the fabricated membranes are also investigated by performing pervaporation test at acidic and basic conditions. This investigation is important due to nature of these copolymers.

The development of a new membrane material is expected. The developed material then will be used for membrane fabrication, which shall show an improved stability under the presence of the impurities described above, combined with acceptable separation properties for bioethanol dehydration.

1. Frolkova, A.K. and V.M. Raeva, *Bioethanol dehydration: State of the art.* Theoretical Foundations of Chemical Engineering, 2010, **44**(4), 545-556.
2. Naik, S.N., *et al., Production of first and second generation biofuels: A comprehensive review. Renewable and Sustainable Energy Review*s, 2010, **14**(2), 578-597.