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# Modified Colloidal Sol-gel Process for Fabrication of Titania Nanofiltration Membranes with Organic Additives

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## Abstract

A modified colloidal sol-gel process with organic additives was proposed for the fabrication of $TiO_2$ NF memb ranes with a MWCO of ~820 Da and a water permeability of ~8 L/($m^2$·h·bar). The properties of the $TiO_2$ materials were greatly influenced by the modified route denoted Route B, but little difference was detected in the materials synthesized via the traditional route denoted Route A. For the $TiO_2$ materials prepared using Route B, the DLS analysis showed that the particle size of the $TiO_2$ hydrosol decreased as the amount of organics increased; the XRD patterns and TEM images confirmed the role of additives in restraining the $TiO_2$ grain growth and A→R transformation. This behavior may be explained by the lower packing and ordering of the nanoparticles, which would inhibit rearrangement among the nanoparticles and slow both the grain growth and phase transformation. After comparing the $N_2$ adsorption-desorption results, the $TiO_2$ material with 90 dwb% glycerin was optimized for forming NF membranes. Small organics were better for this process than larger ones. Finally, the $TiO_2$ NF membranes were fabricated using Route B, and the resultant membranes showed better retention properties compared to that of the $TiO_2$ membranes fabricated via Route A .

**Keywords:** titania; nanofiltration; membrane; modified; colloidal sol-gel process