

## Solvent-resistant Membrane Based on UV Cross-linking of Styrene Functionalized Polyphenylsulfone Prepared by Heck Reaction

Hossein Mahdavi<sup>1</sup>, Mehdi Mahmoudian<sup>2\*</sup>, Ehsan Yousefzadeh<sup>1</sup>, Ehsan Nozad<sup>2</sup>

<sup>1</sup>College of Science, Tehran University, Tehran, Iran

<sup>2</sup>Nanotechnology Research Institute, Urmia University, Urmia, Iran

<sup>2</sup>University of Tehran, Tehran, Iran

### ABSTRACT

*In the present investigation, styrene functionalized polyphenylsulfone (SPPSU) was prepared by reaction of polyphenylsulfone (PPSU) with styrene via Heck reaction. Nanofiltration composite membranes were prepared using crosslinkable styrene-PPSU and the crosslinking reaction performed via UV exposure. Irgacure 2959 and methylenebisacrylamide were added in styrene-PPSU to perform crosslinking reaction. Nanofiltration membranes were tested for Fourier Transform Infrared spectroscopy (FT-IR), Nucleation Magnetic Resonance (NMR), thermal properties, scanning electron microscopy (SEM), and filtration experiments. FT-IR and NMR studies confirmed the substitution of styrene moiety into PPSU main-chains. SEM analysis confirmed the deposition and uniformity of top-layer onto the support. Differential scanning calorimetry (DSC) indicated a decrease in the glass transition temperature of styrene-PPSU. The performance of the membranes changed slightly for acetone and toluene while iso-propanol and n-hexane were completely stable after solvent exposure.*

**Keywords:** Membrane, Heck reaction, Nanofiltration, UV cross-linking

### 1. INTRODUCTION

Polyphenylsulfone (PPSU), as a thermoplastic polymer with high glass transition temperature (T<sub>g</sub>), possesses outstanding thermal stability, good resistance to inorganic acids and bases, high strength and toughness, hydrolytic stability, and is resistant to environmental stress cracking. These features make PPSU a good choice for many separation processes that demand chemically resistant membranes [1]. Generally, sulfone-based polymers are amorphous thermoplastic comprised of aromatic units (phenylenes) bridged with sulfone, isopropylidene or ether moieties. In addition, PPSU has better properties than polysulfone and polyethersulfone [2].

Most polymers used in the membrane technology require an extra cross-linking step because of their low chemical and mechanical properties. Different techniques have been applied to enhance those properties including