The fabrication of stable, non-leachable micro-spherical polymers on solid surfaces, particularly on water treatment membranes, has the advantage of high surface area and high permeability, which is beneficial for anti-fouling coatings. A one-step generation of micro-scale spherical polymeric particles on membrane surfaces was achieved using UV-initiated graft-polymerization of polyethylene glycol methacrylate (PEGMA). The yield of coating was determined gravimetrically (Fig. 1A), surface chemistry by ATR-FTIR and surface morphology by SEM (Fig. 1).

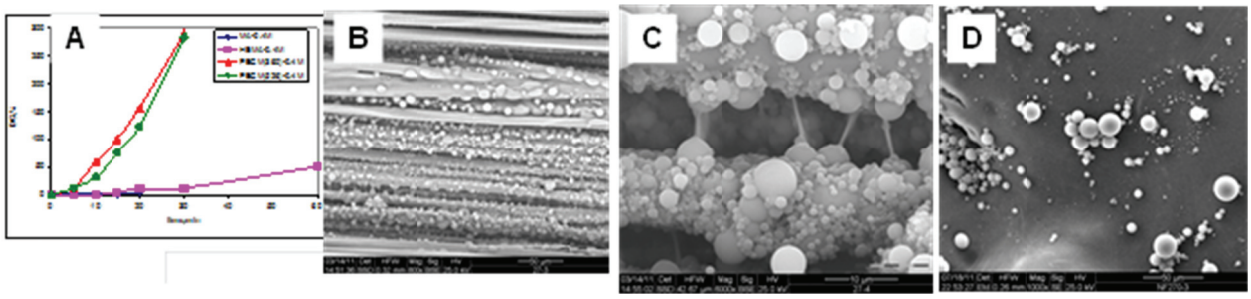


Figure 1*: Degree of graft-polymerization of polyethyleneglycol methacrylate (PEGMA) on polyethylene terephthalate fibers (A) and SEM images (B-C) after graft polymerization. (D) Graft-polymerization on polyamide membrane. Scale bar in B, D is 50 µm, and 10 µm in C.*

Mechanistic studies of the formation of spherical-particle coating was performed with membrane templates with diverse properties, and in varied solvent polarities; it was found that spherical polymeric particles were formed preferentially on hydrophobic templates and in polar solvents. IR and Raman spectroscopy suggested that the spherical shape of the coating was related to the amphiphilic nature of the grafted poly(PEGMA). The effects of grafting UF membranes with poly(PEGMA) were studied in a membrane bioreactor treating domestic wastewater, and results showed no reduction of fouling, however improvement observed in cleaning ability of the membranes.

The method presented here for coating membranes by stable polymer brushes with nano- and micro-spherical structures has also potential implications for other uses such as materials with high sorption capacity, nanoreactors, and resins for heterogeneous chemical catalysis.