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Antifouling Surface Modification of Electrospun Nonwoven Membrane for Water/Oil Separation

Di Tao[1-2], Wei Ma[2], Yuji Higaki[1-3], and Atsushi Takahara[1-3]

[1]*Graduate School of Engineering, Kyushu University*

[2]*International Institute for Carbon-Neutral Energy Research (WPI-I^{2}CNER), Kyushu University*

[3]*Institute for Materials Chemistry and Engineering, Kyushu University*

Hydrophilic surfaces and interfaces have attracted much attention because of their applications in water lubrication, antifouling and nonbiofouling surfaces, and biocompatible materials. One of the useful artificial methods of producing a hydrophilic surface is grafting a polymer onto a solid surface.[1] With this method, the surface properties can be precisely controlled.

Membrane fouling is one of the most important challenges faced in membrane ultrafiltration (UF) operations. Fouling results in flux decline, which increases the energy demand for filtration.[2] In order to overcome this problem for energy saving, we modified polymer electrospun nonwoven membrane through surface-initiated atom transfer radical polymerization (SI-ATRP) with zwitterionic PMAPS (Fig 1).[3] After surface modification, the membrane became superhydrophilic (Fig 2), and was successfully utilized for water/oil separation (Fig 3). Furthermore, the modified membrane showed non-sticky superoleophobic characteristic under water (Fig 4) and low protein adsorption. Using this modified membrane is expected to reduce the fouling of membrane during filtration, and further decrease the energy consumption.

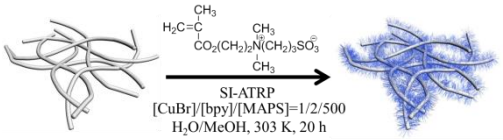

Fig 1. Surface modification of P(MMA-*co*-BIEM) electrospun membrane with PMAPS by SI-ATRP.

Fig 2. Photographs (side view) of water droplet on (a) unmodified and (b) modified membranes in air.

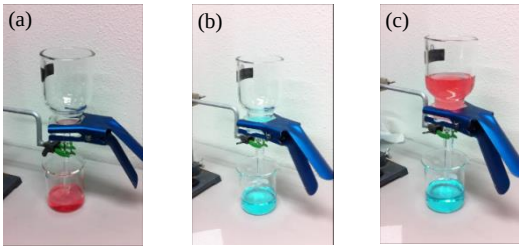

Fig 3. Water/oil separation experiments using P(MMA-*co*-BIEM)-*g*-PMAPS membrane: (a) hexane goes through dry membrane, (b) water goes through dry membrane, and (c) water goes through, but hexane remains on wet membrane.

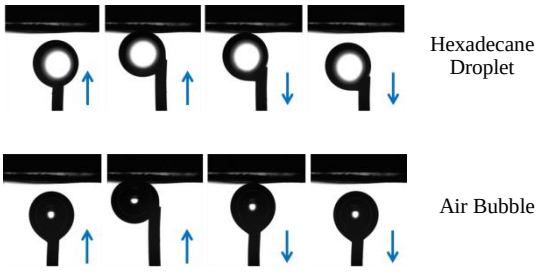

Fig 4. Photographs (side view) of hexadecane droplet and air bubble in contact with P(MMA-*co*-BIEM)-*g*-PMAPS membrane under water.

References

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