

Fabrication and characterisation of superhydrophobic bio-ceramic hollow fibre membranes prepared from cow bone waste

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ABSTRACT

Superhydrophobic membranes have great potential towards various application, especially for thermal-based membrane system such as membrane distillation. In this study, bioceramic hollow fibre membranes derived from cow bone waste were prepared by phase inversion/sintering method, followed by surface modification via immersion grafting with fluoroalkylsilane (FAS) agent. Interestingly, the grafting process led to the formation of hydroxyapatite nanorods, mimicking the unique structure of electrospun nanofiber membranes. The hydrophobicity of the modified membranes was assessed by measuring the water contact angle and showed excellent improvement from hydrophilic property to superhydrophobic with the highest value of 174°. After the modification, the water entry pressure also improved from 0 to 1 bar. In addition, the presence of FAS agent on the membrane surface was observed using X-ray photoelectron spectroscopy (XPS). A correlation between pore size, porosity, and mechanical strength of the modified membrane was discussed; the increment of membrane pore size after grafting process is synonym to the dental erosion mechanism. The result indicates that the superhydrophobic bioceramic hollow fibre membranes derived from cow bone waste have significant potential to be developed for membrane distillation application in treating water and wastewater.

KEYWORDS

Hydroxyapatite; Ceramic membrane; Superhydrophobic

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