HIGH FLUX NANOFIBROUS MEMBRANES FOR WATER PURIFICATION

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ABSTRACT

The fabrication of nanofibers can be accomplished by using a variety of methods, including electro-spinning and a combination of chemical/mechanical processes, especially for cellulose, as a form of green sustainable resource material. Non-woven nanofiber mats have unique properties, such as interconnected pores, a very large surface-to-volume ratio, and a high capacity for surface modifications, making such scaffolds useful for fabrication of high throughput separation membranes. Directed water channels in the barrier layer are formed through the formation of interface between the cross-linked nanofibers and the polymer matrix, while the gap thickness may be regulated by physical interactions or chemical bonding.

In the present context, advances in electro-spinning and fundamental studies on nascent cellulose crystals by means of synchrotron x-ray scattering have provided us with new insight to use the fibrous format with varying pore sizes for applications from micro-filtration via ultra-filtration to nano-filtration. We have taken advantage of unique breakthroughs in chemical modifications and physical scale-up transformations to drastically improve filtration membrane development with predesigned properties. In particular, we have, for example, examined the NF membrane performance as influenced by the barrier layer substrate and reduced fouling by using a highly hydrophilic barrier layer. The same concept has been extended to the pervaporation process by using a highly hydrophilic graphene oxide layer. Performance characteristics of nanofibrous scaffolds for water purification applications are presented.

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Selected References

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