Influence of membrane morphology on characteristics of porous hydrophobic PVDF hollow fiber contactors for CO2 stripping from water

Abstract:

Wetting resistance and gas permeability are the main factors for membrane contactor applications, which can be optimized according to the membrane morphology. In present study, three different types of the membrane morphology were obtained via a dry–wet spinning technique. By measuring cloud point data and viscosity, the polymer dope composition was adjusted to produce the different morphologies. The membranes with large finger-like, small finger-like and almost sponge-like morphology were obtained. The plain PVDF membrane with large finger-likes morphology presented the higher N2 permeance, lower wetting pressure and larger mean pore size (0.08 μm). By addition of phosphoric acid into the spinning dope, the prepared sponge-like morphology resulted in the high surface porosity with small pore sizes, which demonstrated good permeability and wetting pressure. It was found that the mean pore size measured by gas permeation method was approximately three times larger than those from FESEM examination. CO2 stripping from water was conducted through the gas–liquid membrane contactors. The membranes with smaller pore sizes and higher wetting pressure presented higher stripping performance. In conclusion, a structurally developed PVDF hollow fiber membrane for gas–liquid contactor applications can be achieved by controlling the membrane morphology.