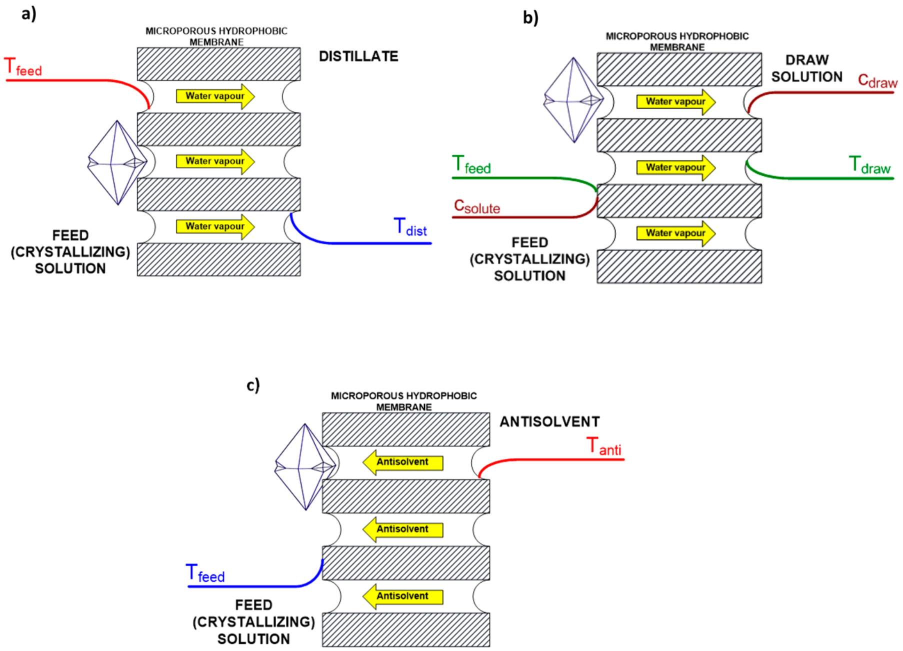

Figure 8.1 Operational principles of a membrane crystallizer. (a) Temperature-driven membrane crystallizer (direct contact configuration), in which a microporous hydrophobic membrane is contacted by the warm crystallizing solution at one side, and by cold pure water on the opposite side; (b) osmotic-driven membrane crystallizer, in which a microporous hydrophobic membrane is contacted by the crystallizing solution at one side, and by a hypersaline solution on the opposite side; (c) antisolvent membrane crystallization: antisolvent is added to the feed solution by diffusion in vapor phase from the opposite side, and the consequent decrease of solubility induces the crystallization.

8.3 Membrane Materials and Transport Phenomena

Although, in principle, a large variety of membranes (having different morphology, surface topology, physico-chemical properties, selectivity *etc.*) can be used in membrane-assisted crystallization applications, microporous hydrophobic membranes are the most appropriate when treating aqueous solutions and, so far, are the most utilized.

Among hydrophobic polymers, fluoropolymers represent a unique class of materials with an interesting combination of properties – such as high thermal stability and chemical resistance, and low surface tension as determined by the low polarizability and the strong electronegativity of fluorine atoms – that have attracted significant attention over the past few decades.[13,14]

Fluorinated polymers and copolymers (the most common are listed in Table 8.1) are widely employed to fabricate membranes at industrial level, often manufactured by non-solvent induced phase separation (NIPS) and thermally induced phase separation (TIPS) methods.