



## Membrane Percrystallisation Technology and Concepts for Mineral Brines, Food and Pharmaceutical Compounds

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### Abstract

The FIM<sup>2</sup>Lab at the University of Queensland pioneered the inorganic membrane percrystallisation technology. The first variant of this technology is hydrophobic membrane bio-inspired from carbonised sugar solution [1]. The transport mechanism is based on solution diffusion through the mesopores of the membranes. This allows for a wet thin-film to be formed on the permeate side of the membrane under vacuum pressure. At the wet thin film interface, the permeated solvent evaporates leading to ideal conditions of continuous nucleation and crystallization of solutes. As a result, both solvent and dry solute are separated in a single-step process. The percrystallisation process delivers small NaCl crystals varying between 10-30  $\mu\text{m}$  as displayed in Fig. 1. This concept was demonstrated for the percrystallisation of mineral salts, food and pharmaceutical compounds [1-3].

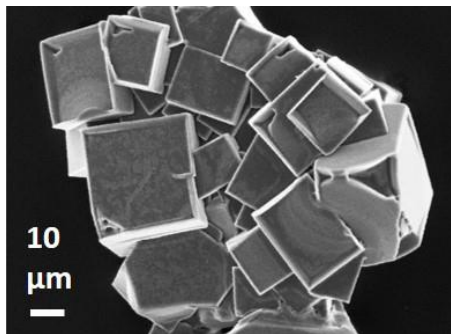


Fig. 1. NaCl crystals formed during percrystallisation using bio-inspired carbon membranes.

The second variant applicable to hydrophilic membranes, percrystallisation of salts occurs via a pore storage mechanism. In this case, only solvent pervaporates under vacuum pressure via a titania or alumina thin film with controlled pores below 9 nm. At the same time, the solute is trapped in the larger mesopores (>50 nm) of the alumina substrate. Upon drying the membrane, salts crystallise on the surface of the feed side due to capillary forces. Salt storage is described by a single salt production coefficient, and a global salt production coefficient for metal chloride salts. This presentation addresses these novel concepts in inorganic membrane science and technology.

### References

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