Reactive crystallisation process for magnesium recovery from concentrated brines

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ABSTRACT

Seawater brines, generated either by natural or anthropic processes, often cause significant environmental issues related to their disposal. A clear example is the case of brines from desalination plants, which can have severe environmental impacts on the receiving water body. On the other side, brines can represent a rich and appealing source of raw materials, especially when they are very concentrated, as it happens with bitterns (i.e. exhausted brines) produced in saltworks. In particular, magnesium concentration can reach values up to 30–40 kg/m\textsuperscript{3} of brine, which is 20–30 times that of typical seawater. An experimental campaign has been carried out in the present work for assessing the potentials for magnesium recovery from concentrated brines. Real brines were collected from the final basins of the saltworks operating in the district of Trapani (Sicily, Italy). Experiments were performed both in a semi-batch and in a continuous 5 liters crystalliser operated by a reactive precipitation process. NaOH solutions were adopted as standard alkaline reactant in order to assess the influence of all operating parameters and reactor configuration on the recovery efficiency and purity of the Mg(OH)\textsubscript{2} powder produced. Results have highlighted a very promising strategy for the recovery of Mg from concentrated brines, which could be scaled up and applied to a number of different scenarios, including existing saltworks and newly designed integrated cycles for Zero Liquid Discharge desalination.

Keywords: Brine disposal; Magnesium; Minerals recovery; Saltworks; Reactive crystallisation

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