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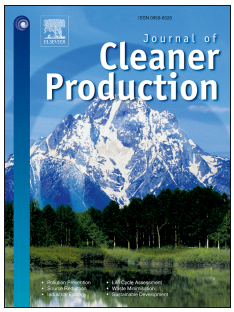

Investigation of the properties of MgO recovered from reject brine obtained from desalination plants

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Investigation of the properties of MgO recovered from reject brine obtained from desalination plants

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Abstract

In addition to its use in various applications such as those in the agriculture, pharmaceutical and refractory industries, MgO is being investigated as a cement binder due to the low calcination temperatures used during its production and its ability to gain strength by absorbing CO_2 in construction products. Similar to the dry-route, the reactivity of MgO synthesised from waste water or reject brine via the calcination of the precipitated $Mg(OH)_2$ depends on the calcination conditions. This study investigated the influence of two bases, namely ammonia solution (NH_4OH) and sodium hydroxide (NaOH), on the properties of $Mg(OH)_2$ precipitated and consequently the characteristics of MgO produced under different calcination conditions. The energy consumption of the production of reactive MgO from reject brine via the addition of NH_4OH and NaOH was also reported and compared with the industrial production routes to assess the sustainability of the production procedure. The final products were characterised in terms of their specific surface area (SSA) and microstructure. Results indicated that $Mg(OH)_2$ synthesised via the addition of NH_4OH into reject brine generated a more porous, flake-like morphology than those obtained via the use of NaOH. The SSA and reactivity of NH_4OH-based MgO demonstrated a sharper decrease with increasing temperature and duration compared to NaOH-based MgO. Out of all samples, NH_4OH-based MgO calcined at 500 °C for 2 hours revealed the highest reactivity (SSA of 78.8 m^2/g), which was higher than NaOH-based MgO (SSA of 51.4 m^2/g).

Keywords: *Reject brine; MgO; cement; characterisation; reactivity*

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