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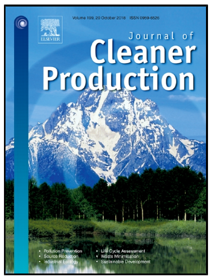

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A COMPARISON OF CARBON FOOTPRINTS OF MAGNESIUM OXIDE AND MAGNESIUM HYDROXIDE PRODUCED FROM CONVENTIONAL PROCESSES

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Abstract

In this study, modelling the carbon footprints of magnesium oxide and magnesium hydroxide (>99% purity) production based on technologies treating bischofite brines (e.g. Aman process) and serpentinite ores (e.g. Magnifin process) was performed. The two technologies have been utilised by many producers around the world to deliver specialty magnesium products. Using theoretical values of heat of reaction obtained from HSC (H-enthalpy, S-entropy and Cp-heat capacity) software simulations and the practical thermal efficiency of roasting and pyrohydrolysis equipment, greenhouse gas (GHG) emissions of 2.7-5.6 kg CO_{2eq}/kg MgO and 1.6-3.3 kg CO_{2eq}/kg $Mg(OH)_2$ were estimated for the process treating a bischofite brine. The corresponding figures calculated for the process recovering magnesium values from a serpentinite ore were determined as 3.8-7.5 kg CO_{2eq}/kg MgO and 2.6-5.2 kg CO_{2eq}/kg $Mg(OH)_2$. They are somewhat comparable to MgO's carbon footprint of 3.1-4.5 kg CO_{2eq}/kg MgO from Chinese producers using one-stage magnesite calcination to produce caustic calcined magnesia (~92% purity). From a carbon footprint perspective, it is apparent that the brine process provides the lowest environmental burdens compared to the serpentinite and magnesite routes.

Keywords: Carbon footprint, magnesium oxide, magnesium hydroxide, bischofite brine, serpentinite

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