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Reutilization of the by-products from the calcination of magnesite as desulfurization agents: A sustainable and closed-loop process

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The European Commission is encouraging the Cement, Lime and Magnesium Oxide Manufacturing Industries to reutilize collected particulate matter or wastes in the emission control of SO_2 with a 100% removal efficiency. Following this directive, three different by-products from the calcination of natural magnesite were selected in order to evaluate their desulfurization capacity. By this manner, the by-products from the calcination process itself could be reused as desulfurization agents in a sustainable and closed-loop process. The saturation time, defined as the time for the total neutralization of SO_2 was used to determine consumption values at laboratory scale with 100% removal efficiency. The optimum by-product was further analyzed with respect the synergistic effect of the most important parameters. Therefore, the reutilization of these by-products in a wet flue gas desulfurization process is a feasible and sustainable choice that allows extending their life-cycle.

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Inertization of wastes in the steelworks

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One of the priorities of Europe is the promotion of environmental sustainability at the basin level to improve socio-economic development and to promote better human conditions. To promote environmental sustainability the objective "zero waste" is a priority, in particular the reuse and/or the recycling of waste as resource. The vitrification of wastes from steel industry processes to produce not hazardous materials has been investigated to obtain product as raw material for different type of industries. In order to assess the chemical resistance of the produced glasses, samples were subjected to leaching tests in acid solution and in pure water according to UNI EN 12457-2:2004 and very low release values for metallic micro pollutants were obtained for all the produced materials. The samples with the highest amount of iron oxide clearly show the crystallization of iron oxides: magnetite/maghemite and hematite. This behavior suggests that the maximum amount of iron oxides that the glass network can incorporate is about 30% by weight (as Fe_2O_3); if this level is exceeded, pure iron oxide phases separate. In the raw materials the iron ions are mostly (more than 98%) introduced as Fe3+, but temperature and environment promote a partial reduction of the iron ions from Fe^{+3} to Fe^{+2} and the formation of magnetite (together with hematite).

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