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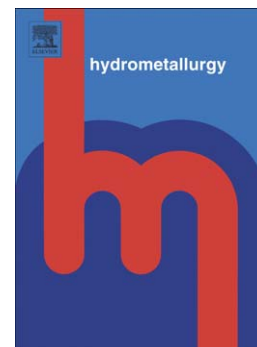
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## Gallium and Vanadium Extraction from Red Mud of Turkish Alumina Refinery Plant: Hydrogarnet Process

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### Abstract

In this paper the treatment of red mud by autoclave leaching for its conversion into ferrous hydrogarnet product and extraction of valuable components (i.e.  $\text{Na}_2\text{O}$ ,  $\text{Al}_2\text{O}_3$ , Ga and  $\text{V}_2\text{O}_5$ ) was investigated. Leaching of red mud using high modulus alkaline solution ( $\text{Na}_2\text{O}$  240 g/L;  $\alpha_k=30$ ) in the presence of lime at 240-260°C was found to allow the recovery of the contained values (98.5%  $\text{Na}_2\text{O}$ , 65.3%  $\text{Al}_2\text{O}_3$ , 55.5% Ga and 65.8%  $\text{V}_2\text{O}_5$ ) and the fixing silica in the form of hydrogarnet mud ( $3\text{CaO} \cdot \text{Fe}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$ ) with alow alkali content (0.35%  $\text{Na}_2\text{O}$ ). An effective treatment scheme for the leach solution based on precipitation and two-stage carbonization processes was developed and demonstrated. This allowed the generation of alkaline solutions suitable for recycling back to leaching stage and recovery of a concentrate (30%  $\text{Al}_2\text{O}_3$ ) that is rich in Ga (0.32%) and  $\text{V}_2\text{O}_5$ (3.7%).The chemical and phase composition of the solid products obtained from each stage of processing were determined by XRF and XRD analyses. This study has demonstrated that Bayer-hydrogarnet process can be suitably exploited for processing of red mud.

**Keywords:** Red mud; Hydrogarnet process; Hydrated tricalcium aluminate; Aluminium-carbonaceous sediment

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