Preparation of Titanium by Electro-deoxidation of CaTiO_3 in a Molten CaCl_2 - NaCl Salt

Ying Xu, Guoli Zhao, Yanqing Cai*

College of Material Science and Engineering, North China University of Science and Technology, Tangshan, China

*E-mail: caiyanning126@126.com

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Calcium titanate (CaTiO_3) is the main mineral phase of titanium-bearing blast furnace slag after selective enrichment, growth and separation. It is the titanium-bearing material closest to the primary mineral, titanium. In this study, CaTiO_3 was used as the precursor, and titanium metal was prepared by electro-deoxidation of CaTiO_3 in molten CaCl_2 - NaCl salt. The feasibility of preparing titanium from CaTiO_3 was analyzed by calculating the decomposition voltages, energy band structures and densities of states of the raw materials during the process of converting CaTiO_3 into titanium. To understand the reduction mechanism in the process of preparing titanium from CaTiO_3 , electrolytic experiments were carried out for different times on a cathode of CaTiO_3 sintered at 1200°C . The research showed that the reduction process of CaTiO_3 was $\text{CaTiO}_3 \rightarrow \text{Ti}_2\text{O}_3 \rightarrow \text{TiO}/\text{Ti}_2\text{O} \rightarrow \text{Ti}[\text{O}]_6 \rightarrow \text{Ti}$. Finally, a deoxidation model of CaTiO_3 in CaCl_2 - NaCl molten salt was established.

Keywords: Calcium titanate, Electro-deoxidation, Titanium

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