NEW TITANIUM PRODUCTION PROCESS BY MAGNESIOTHERMIC REDUCTION OF TITANIUM SUBHALIDES

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Currently, several studies on a new titanium production process are being conducted in order to replace the current titanium production process that is based on the Kroll process[1]. For example, a direct reduction process of titanium oxide, such as the FFC process[2], the OS process[3], and the EMR/MSE process[4], is now being actively investigated. These processes, however, require leaching process for metal/salt separation, and it is difficult to control impurity content in the obtained titanium. Many technical problems need to be solved before establishing a large-scale commercial process. In this study, a new titanium reduction process, which utilizes some advantages of the magnesiothermic reduction of chlorides, is investigated. To increase the reduction speed and establish a continuous process, a titanium subhalide is reduced to titanium by magnesiothermic reduction. To evaluate the feasibility of high production speed of high-purity titanium, titanium dichloride ($TiCl_2$) or titanium trichloride ($TiCl_3$) feed and magnesium were charged into a reaction vessel made of titanium or lined with titanium foil, and the vessel was heated at 1073 K for 7.2 ks in an argon atmosphere. After the reduction experiment, sponge titanium with more than 99% purity (analyzed by XRF) was obtained. The original shape of the reaction vessel was retained, which proves that a titanium reaction vessel can be utilized in this for the reduction process. Presently, we are developing an efficient process to separate titanium from magnesium chloride ($MgCl_2$) and magnesium. This study discusses the possibility of establishing a high speed, semi-continuous titanium production process by magnesiothermic reduction of subhalides using a titanium reaction vessel.

References:

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