Purification of Used Zr Scrap by Molten Salt Electrorefining

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Abstract

Zr and its alloys are one of the most important materials used as cladding nuclear fuels because of its high dimensional stability, good corrosion resistance and especially, lowest neutron-absorbing cross section. However, manufacturing costs of nuclear grade Zr from Zircon ore is very high because satisfying compositional regulation is very difficult, which included separation of impurities, using multiple solvent extraction and distillation. And also, purification of used Zr demands same processes compared with zircon ore refining process. In this study, Zr scrap was recycled by molten salt electrorefining instead of commercial process. For pure Zr production from Zr scrap, electrochemical cut-off potential was controlled by applied current density, during the this process noble metal impurities such as Nb, Sn Fe and etc. drop down to the bottom of electrolyte cell. Corrected Zr deposits were analysed by SEM, XRD, TGA, ICP-MS. As a result of molten salt electrorefining, composition of Zr was limited under ASTM B349, nuclear grade Zr sponge specification.