



PRELIMINARY STUDY ON MINERALOGY AND CHEMISTRY OF SRI LANKAN ZIRCON SANDS TO BE USED FOR EXTRACTION OF HAFNIUM

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Abstract

Zircon (zirconium silicate, $ZrSiO_4$) is the primary source of zirconia. Beach sands in Sri Lanka contain zircon along with ilmenite, rutile and monazite. Zircon is often expressed as $(Zr, Hf)SiO_4$ when hafnium is present as the major impurity in the crystal lattice. Hafnium can be a by-product of zircon processing and purification if it is present in extractable amounts. Therefore, this study is focused to produce high-purity zirconia and extract hafnium from Sri Lankan zircon sand. In this project, zircon samples (separated from heavy mineral bulk) were collected from a mineral sands processing plant at Pulmoddai, Sri Lanka. Mineralogy of the initial zircon sand was characterized under EMZ-13TR MEIJI Microscope, whereas X-ray fluorescence (XRF) and X-ray diffraction (XRD) analyses were used to determine the chemical composition and the mineral phases present, respectively. XRF results showed the occurrence of ~44.35% of ZrO_2 , ~40.36% of SiO_2 and ~9.18% of Al_2O_3 and the rest compensated by other minor oxides. XRD spectra of zircon revealed $ZrSiO_4$ and $HfSiO_4$ as the major mineral phases. In addition, yttrium (Y), erbium (Er) and phosphorous (P) are present in trace amounts. Accordingly, the results suggest an inductively coupled plasma mass spectrometric analysis for further evaluation of zircon sand to detect the amount of rare earth elements (REEs) present. Subsequently, ion-exchange purification after concentrated hydrochloric (HCl) acid digestion will be used for the separation of ZrO_2 and Hf. Finally, the purified zirconia will be tested for possible applications in advanced ceramics.

Keywords: Zircon, hafnium, zirconia, extraction, advanced applications