

Solubility of Zirconium Dioxide at Elevated Temperatures

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The heat transport purification system of CANDU[®] nuclear reactors is used to purify the coolant and remove particulate and dissolved impurities. Zirconium dioxide shows some potential as a high temperature ion exchange medium for cationic and anionic impurities found in the CANDU heat transport system (HTS). Furthermore, zirconium in the reactor core can be neutron activated, and potentially dissolved and transported to out of the core locations in HTS. However, the solubility of zirconium dioxide in high temperature aqueous solutions has rarely been reported. This paper reports the solubility of zirconium dioxide in 10^{-4} M LiOH solution, determined between 25 to 300°C using a static autoclave. Over this temperature range, the measured solubility of zirconium oxide was between 0.5-15 ppb, with a minimum solubility between 150 and 250°C. This low solubility suggests that its use as a high temperature ion exchanger would not introduce significant unwanted contaminants to the system. A thermodynamic analysis of the solubility data to determine the dissolved zirconium species in high temperature aqueous solution is being performed.

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