Measurements of Bubble Point Pressures of Zirconium Tetrachloride and Hafnium Tetrachloride Using High-Pressure Experimental Apparatus

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Zirconium alloys have been used for fuel cladding and other structural components in water-cooled nuclear reactors due to the combination of their low thermal neutron capture cross-section, good corrosion resistance in high temperature water and respectable mechanical properties. In the present study, the vapor pressures of zirconium and hafnium chlorides were determined in the liquid region. Equations for the vapor pressure curves were calculated by a method of least squares in the liquid region for ZrCl4 or HfCl4. Furthermore, the bubble point pressures of zirconium and hafnium chloride mixture were measured by using a high – pressure experimental apparatus at various ZrCl4 compositions in the range of temperature below the critical point of HfCl4. It is found that, depending on the vapor-liquid equilibrium investigation, an efficient distillation method has been developed to produce zirconium powder with low hafnium content.

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