Kirk-Othmer Encyclopedia of Chemical Technology.

FLUORINE COMPOUNDS, INORGANIC, TANTALUM

1. Tantalum Pentafluoride

Tantalum pentafluoride [7783-71-3], TaF_5, a white solid with a reported mp of 97°C and a bp of 229°C (1), is the only known binary fluoride. The vapor pressure of TaF_5 in kPa is given by the equation $\log P_{kPa} = 7.649 - 2834/T$ over the temperature range of 80–230°C and the heat of vaporization is 54.4 kJ/mol (13 kcal/mol) (1).

There are a number of methods of preparation for TaF_5. For example, tantalum pentafluoride has been produced by the reaction of F_2 or ClF_3 and Ta metal (2, 3), by contacting Ta_2O_5 with excess HF in the presence of a dehydrating agent (4), by the reaction of Ta-containing ores and HF–H_2SO_4 followed by extraction with an organic solvent (5, 6), by reaction of Ta_2O_5 and COF_2 (7), by heating ammonium hexafluorotantalate (8), by contacting fluorotantalic acid with a dehydrating agent containing C–Cl or C–Br bonds (9) and by halogen exchange of $TaCl_5$ with HF (10).

TaF_5 has been characterized by ir, Raman, x-ray diffraction, and mass spectrometry (3, 11, 12). TaF_5 has been used as a superacid catalyst for the conversion of CH_4 to gasoline-range hydrocarbons (qv) (12); in the manufacture of fluoride glass and fluoride glass optical fiber preforms (13), and incorporated in semiconductor devices (14). TaF_5 is also a catalyst for the liquid-phase addition of HF to polychlorinated ethenes (15). The chemistry of TaF_5 has been reviewed (1, 16–19). Total commercial production for TaF_5 is thought to be no more than a few hundred kilograms annually.

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