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Osmium-Ruthenium Coatings

To accommodate new uses, the cathodes in travelling wave tubes need to operate at higher frequencies and output powers; thus they have to function at higher temperatures and current densities. The life of coated tungsten cathodes is limited by tungsten diffusion; to prevent this the cathodes operate at 950°C_B (brightness temperature).

Therefore the degradation of a porous tungsten cathode impregnated with barium calcium aluminate and coated with an osmium-ruthenium film has been studied (N. Mita, *IEEE Trans. Electron Devices*, 1991, **38**, (11), 2554). During tests tungsten diffused into the surface, converting it to osmium-ruthenium-tungsten. The activation energy for the tungsten diffusion coefficient was 8.4 eV, giving a stable period for the coating of over 100,000 hours at a cathode temperature of 1050°C_B, and the coating could be operated at a current density of 30 A/cm^2.