

THE PRESENT STATUS AND THE PROJECTED PROGRAMME
OF ZIRCONIUM DEVELOPMENT IN INDIA (*)

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The nuclear power industry continues to be the major consumer of zirconium metal production in the world to-day. On the basis of neutron economy, corrosion resistance, and mechanical strength, zirconium alloys have been the ideal choice for the fuel-cladding and other core components in water-cooled nuclear power systems. In the United States alone, the current annual requirements of zircaloy tubing for nuclear fuel cladding has been placed at 250 tons, which will grow to 600 tons by 1970 and 1000 tons by 1974. In India, for the 1200 MW(e) nuclear power programme envisaged for the IV Plan period zircaloy tube requirements have been estimated at 50 tons per year and will increase to 75 tons and more during the V Plan period.

There is also a small but growing market for commercial grade zirconium in the form of very fine powder for 'gettering', photo-flash and detonator applications, and in the form of thin foils in flash-bulbs.

The raw material for the production of both nuclear grade and commercial grade zirconium metal is the mineral zircon ($ZrSiO_4$), of which India has abundant reserves in the Kerala beach sands.

The paper surveys the current world situation with respect to zirconium development, and highlights the achievements in the Indian programme. Pilot plant work carried out at the Bhabha Atomic Research Centre Trombay on (i) the processing of Indian zircon for the removal of hafnium and other impurities by

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solvent-extraction and the production of nuclear grade ZrO_2 , (ii) the conversion of the pure oxide to ductile sponge metal via the chloride route by magnesium (or sodium-magnesium) reduction of $ZrCl_4$ followed by vacuum separation of the by-products, and (iii) the production of homogeneous zirconium alloys by consumable-electrode arc melting, is described. Based on the know-how generated at Trombay, a Zirconium Plant with a capacity to produce initially 50 tons/year of zircaloy tubing has been designed, and will be commissioned at Hyderabad, Andhra Pradesh, in about two years. It is also proposed to locate at the same site a small facility for the production of commercial grade micronsize zirconium metal powder to meet the local demand.

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