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RECYCLING AND UTILIZATION OF SPENT MOLYBDENUM DISILICIDE: PREPARATION OF COATING AND METAL RECOVERY VIA SYNERGISTIC SMELTING

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Abstract

Molybdenum disilicide (MoSi2) heating elements are widely used in the industrial and laboratory high-temperature heating field. Based on the excellent oxidation resistance of MoSi2, solid waste from spent heating elements was used as raw material to fabricate silicide-based anti-oxidation coatings on refractory metals (Mo, Nb, etc.). After oxidation at 1500 °C for 40 hours, the coating exhibited a minimal weight gain of 2.78 mg/cm2, and which surface formed a crack-free, continuous SiO2 oxide film. The coating demonstrated dense morphology, controllable thickness, uniform composition, and strong interfacial bonding.

Given the high molybdenum content in spent molybdenum disilicide and the elevated iron content in metallurgical iron-containing slags, the two solid wastes were subjected to synergistic reduction smelting. Through high-temperature pyrolysis of MoSi2, silicon and iron reduction, in situ generation of molybdenum and iron, the key metal molybdenum in retired silicon molybdenum was selectively recovered, and molybdenum alloy was synchronously prepared in situ. The recovery efficiencies reached 98.62% for molybdenum and 99.12% for iron, achieving synergistic high-value utilization of high-grade metals from multi-component solid wastes.

Keywords: *Spent molybdenum disilicide; Coating; Molybdenum iron recovery; Comprehensive recovery*