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固定床煅烧炉中载铯亚铁氰化钛钾的热分解研究

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摘要 The thermal decomposition of potassium titanium hexacyanoferrate(Ⅱ) (KTiFC) loaded with cesium (referred to as Used Exchanger, or UE) was studied at different flow rate of air in a fixed bed calciner. The calcination process consisted of four stages: ambient temperature—180℃ (stage Ⅰ), 180—250℃ (stage Ⅱ), 250—400℃ (stage Ⅲ), and constant 400℃ (stage Ⅳ). The most intense reaction occurred in stage Ⅱ. The rate of thermal decomposition was controlled, depending on the O2 flux, by O2 or CN concentration in different stages. Results from differential thermal analysis (DTA) showed that the calcination reaction of the anhydrous UE was exothermic, with an approximate heat output of 4.6kJ•g−1, which was so large to cause the possible agglomeration of calcined residues. The agglomeration could be avoided by enhancing heat transfer and controlling the O2 flux. It was found that there was no cyanides in the calcined residues and no CN-bearing gases such as HCN and (CN)2 in the off-gas. It seemed that the catalytic oxidation furnace behind the fixed bed calciner could be cancelled.

关键词 thermal decomposition; fixed bed calciner; potassium titanium hexacyanoferrate (Ⅱ) (KTiFC); agglomerate

分类号

Thermal decomposition of potassium titanium hexacyanoferrate(II) loaded with cesium in a fixed bed calciner

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Abstract

The thermal decomposition of potassium titanium hexacyanoferrate(Ⅱ) (KTiFC) loaded with cesium (referred to as Used Exchanger, or UE) was studied at different flow rate of air in a fixed bed calciner. The calcination process consisted of four stages: ambient temperature—180℃ (stage Ⅰ), 180—250℃ (stage Ⅱ), 250—400℃ (stage Ⅲ), and constant 400℃ (stage Ⅳ). The most intense reaction occurred in stage Ⅱ. The rate of thermal decomposition was controlled, depending on the O2 flux, by O2 or CN concentration in different stages. Results from differential thermal analysis (DTA) showed that the calcination reaction of the anhydrous UE was exothermic, with an approximate heat output of 4.6kJ•g−1, which was so large to cause the possible agglomeration of calcined residues. The agglomeration could be avoided by enhancing heat transfer and controlling the O2 flux. It was found that there was no cyanides in the calcined residues and no CN-bearing gases such as HCN and (CN)2 in the off-gas. It seemed that the catalytic oxidation furnace behind the fixed bed calciner could be cancelled.

Key words thermal decomposition; fixed bed calciner; potassium titanium hexacyanoferrate (Ⅱ) (KTiFC); agglomerate

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