

High temperature purification of natural graphite for nuclear applications

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The natural graphite, including flake graphite and microcrystalline graphite, plays an important role in the production of nuclear graphite in high-temperature gas-cooled reactor. The flake graphite is a key raw material of the graphite pebble, which is made from 64% natural flake graphite, 16% artificial graphite and 20% phenolic resin. The microcrystalline graphite based isotropic graphite has a high graphitization degree, a low coefficient of thermal expansion, so as to show a considerable potential application as nuclear graphite.

High temperature treatment up to 2500 °C is an effective approach to purifying both the natural flake graphite and microcrystalline graphite. Ten different natural graphite ores from China are purified by high temperature treatment in the presence of halogen. By optimization of the temperature curve, nuclear grade flake graphite and microcrystalline graphite samples were obtained. And the most favorable flake graphite ores were selected for future HTR-PM pebbles. The impurity evolution behavior in the range of 200-2500 °C was analyzed as well. For safety concerns, measures should be taken to avoid the massive evolution of impurity in a narrow temperature range during industry scale purification production.

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