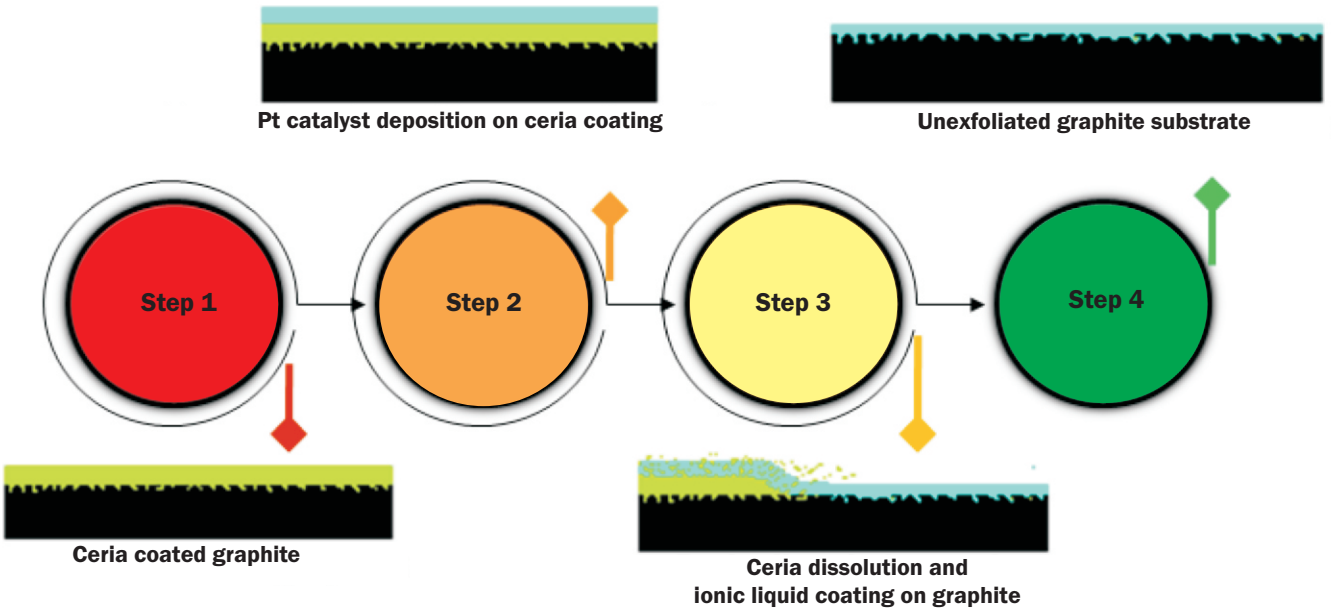
Sonocatalytic Recovery of Ceria from Graphite and Inhibition of Graphite Erosion by Ionic Liquid Based Platinum Nanocatalyst



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Inhibition of graphite erosion was intensified using ultrasound for yttria coated graphite substrates.

Use of ultrasound as an intensified non-destructive decontamination technique for processing graphite limits its reusability beyond a few number of decontamination cycles due to the exfoliation of graphite due to cavitation effects. A recent article (Lahiri *et. al.*, *'Sonocatalytic recovery of ceria from graphite and inhibition of graphite erosion by ionic liquid based platinum nanocatalyst'*, Ultrasonics Sonochemistry, 2022, **82**, 105863) established that the use of platinum nanoparticles in the leachant reduces the erosion of graphite substrate due to cavitation. It presents an improved way of sonochemical recovery of ceria using a mixture of nitric acid, formic acid and hydrazinium nitrate in the presence of platinum nanoparticles and ionic liquid. The platinum nanoparticles catalyst in ionic liquid prevented the generation of the carbon residue due to the combined effect of denitration and reduced sonication. The presence of the catalyst showed a fivefold increase in dissolution kinetics of ceria as well as absence of graphite erosion, facilitating better chances of graphite recycling than the decontamination without the catalyst. The catalytic approach offers a better recycle strategy for graphite with reduced exfoliation and NO_x generation due to denitration, making it a more sustainable decontamination process. Since ceria is used as a surrogate for plutonium oxide, the results can be extended to decontaminate such deposits clearly establishing the utility of the presented results in the nuclear industry.

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