Title: Phytoconstituents assisted green synthesis of cerium oxide nanoparticles for thermal decomposition and dye remediation

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<AT><remove picture pageno 1>Phytoconstituents assisted green synthesis of cerium oxide nanoparticles for thermal decomposition and dye remediation

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<ABS-Head><ABS-HEAD>Graphical abstract
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<ABS-HEAD>Highlights► CeO_2 nanoparticles (NPs) are synthesized by eco-friendly green synthesis ► Azadirachta *indica* leaf extract as reducing agent is used ► CeO2 NPs effectively apply as catalysts for thermal and photo catalytic applications ► Addition of CeO_2 NPs significantly reduces the decomposition temperature of AP ► CeO_2 NPs exhibits the good degradation rate of 96% within 120 min.
 <ABS-HEAD>Abstract
<ABS-P>A cost effective green synthesis with high yield was adopted to synthesize the cerium dioxide (CeO_2) nanoparticles (NPs) using leaf extract of Azadirachta *indica* plant as reducing agent for thermal and photo catalytic processes. The composition and surface properties of green synthesized CeO_2 NPs were determined by observing the elemental analysis and X-ray photoelectron spectroscopy (XPS). The thermal catalytic activity of green synthesized CeO_2NPs toward the decomposition of ammonium perchlorate (AP) was comprehensively demonstrated by differential scanning calorimetry and thermogravimetry analysis techniques. The addition of green synthesized CeO_2 NPs in AP showed a significant drop in decomposition temperature of AP by 130^oC and reduction in activation energy of pure AP, indicating excellent thermal catalytic behavior of CeO_2 NPs. Photocatalytic activity was examined by performing the Rhodamine B dye photodegradation and observed that the green synthesized CeO_2 NPs exhibited the good degradation rate of 96% within 120 min.
<KWD>Keywords: Azadirachta *indica*;;;; CeO_2 nanoparticles; green synthesis;

Photodegradation; Ammonium perchlorate; Catalytic properties.

<H1>1. Introduction

Cerium (Ce), a lanthanide group element with 4felectrons has attracted attentions from researchers in physics, chemistry, biology and materials science. Recently, the oxide of Ce i.e., Cerium oxide (CeO_2) is vastly used semiconducting materials with a wide band gap energy of 3.19eV and large exciton binding energy [1]. CeO_2 nanomaterials show a variety of promising