Green synthesis of cerium selenide nanoparticles derived from areca nut extract decorated on graphitic carbon nitride for improving photocatalytic activity

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In this study, a composite photocatalyst consisting of cerium selenide (CeSe) nanoparticles and graphitic carbon nitride (CN) was successfully synthesized using Areca nut extract as a green reducing and stabilizing agent. The CeSe nanoparticles were subsequently incorporated onto the surface of CN to construct a heterostructured material for enhanced photocatalytic hydrogen peroxide (H_2O_2) production. The synthesized materials were comprehensively characterized using a range of advanced analytical techniques, including field-emission scanning electron microscopy (FE-SEM), X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), photoluminescence spectroscopy (PL), and UV–visible spectroscopy (UV–Vis). The photocatalytic performance toward H_2O_2 generation was systematically investigated by varying the CeSe loading content and the solution pH. Furthermore, the stability, reusability, and possible photocatalytic mechanisms responsible for H_2O_2 production were thoroughly examined.

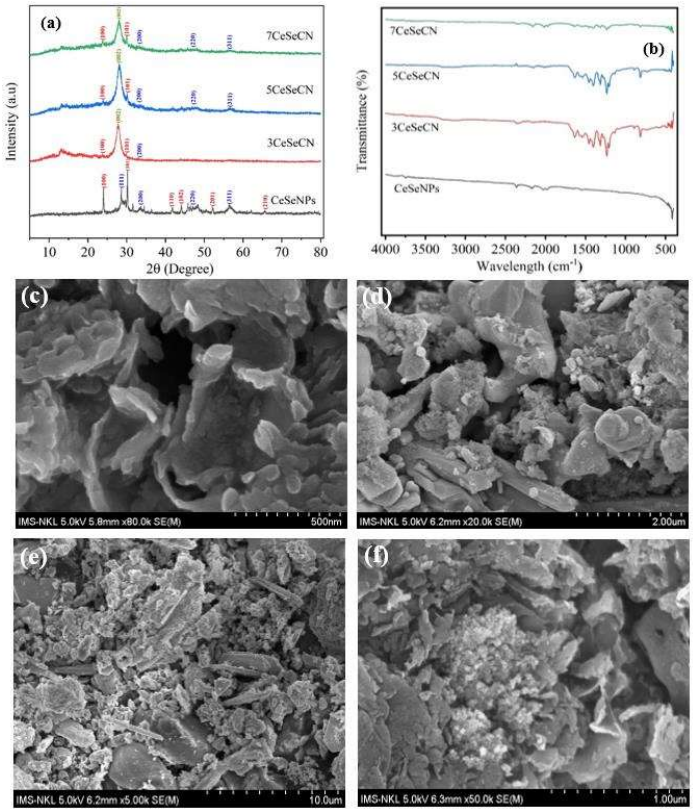

Figure 1. (a) XRD patterns, (b) FTIR spectra, and (c-f) SEM images of CeSe, 3, 5, and 7CeSeCN