Effect of annealing on the Optical Properties of bio-synthesized Cr_2O_3 Nanoparticles

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Abstract:

Green synthesized Cr_2O_3 nanoparticles (NPs) have been successfully demonstrated via an entirely green process. The synthesis was free of solvents and residuals to obey green synthesis principles and the impartation of environmental wellbeing. Structural analysis affirmed all samples annealed for 1h to 4h and heat temperatures for 500 and 700°C for 2h time were well crystalline and exclusively Eskolite Cr_2O_3 phase. Additionally, crystallinity and grain size increased from 3nm to 50nm as the temperature increases from 200 to 700°C for green synthesized Cr_2O_3 NPs. However, the grain size decreases as the annealing period increases from 2h to 4h and in the contrary the dislocation density and strain of the green synthesized Cr_2O_3 increase slightly. The FTIR affirmed that the presence of Cr_2O_3 in all prepared samples and the adsorbents and moister were affected by the temperature and time elevation. Furthermore, the band gap energy of the prepared samples directly affected by the annealing heat temperature and grain size. This could determine the optical nature of the produced green synthesized Cr_2O_3 nanoparticles. Moreover, the UV-Vis -NIR analysis confirmed the green synthesized Cr_2O_3 NPs prepared at 500 and 700°C possessed high absorptance in the region of 200-2500nm. Likewise, samples prepared for duration of 2 to 4h, exhibits excellent absorptance in the region of 200-2500nm. This property indicates that the produced Cr_2O_3 NPs could be a promising choice for selective solar absorber applications.

Keywords: Green Synthesis; Cr_2O_3 Nanoparticles; Annealing Time; Annealing Temperature, Optical properties.

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