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THE MORPHOLOGICAL, STRUCTURAL, OPTICAL AND ANTIBACTERIAL CHARACTERISTICS OF CR203 NANOPARTICLES: A COMPREHENSIVE STUDY

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Calcination via thermal treatment using a precursor material is employed in the generation of Cr_2O_3 nanoparticles. Precursor materials included chromium nitrate in addition to a capping agent of polyvinylpyrrolidone. A range of analytical techniques: X-ray diffraction (XRD); energy dispersive X-ray (EDX); transmission electron microscopy (TEM); and Fourier transform infrared spectroscopy (FT-IR) were used to characterise the samples generated. The observation that the Cr_2O_3 nanoparticles results exhibited hexagonal crystalline structures was demonstrated by XRD analysis. The Cr and O in the Cr_2O_3 nanoparticle samples was confirmed as original materials using energy-dispersive X-ray spectroscopy and Fourier-transform infrared spectroscopy phase analysis. TEM results demonstrated that the different of calcination temperature from 500 to 800 °C resulted in an increase average nanoparticle size from 4 nm to 16 nm. X-ray photoelectron spectroscopy (XPS) analyses were used to investigate surface composition and valence state of the final nanoparticle product. Assessment of the optical energy gap using the Kubelka–Munk equation was achieved by utilization of diffuse UV-visible reflectance spectra, revealing that the energy band gap reduced with increasing calcination temperature: from 3.12 to 3.01 eV. Furthermore, increasing particle size was also found to be associated with increased photoluminescence as demonstrated by photoluminescence (PL) spectra. Lastly, antibacterial activity of the chromium oxide nanoparticle was assessed *in-vitro* using *Escherichia coli ATCC 25922 Gram (-ve) and Bacillus Subtilis UPMC 1175 Gram (+ve).*

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