The positive correlation between the dispersion and catalytic performance of Fe_2O_3 nanoparticles in nano-Fe_2O_3–ultrafine AP energetic composites supported by solid UV-vis spectrum

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Theoretical basis for the dispersity of nano-Fe_2O_3 in ultrafine AP

UV-Vis diffuse reflectance spectroscopy tests were performed on each sample with UV-2600. $BaSO_4$ was the comparison sample; the wavelength range was 1100–190 nm; the photometric range was from −5 to 5 Abs; wavelength accuracy was ±0.3 nm; resolution was 0.1; and wavelength scan was 0.5 nm; stray light was <0.005%; and the detector was a photomultiplier tube. This study was based on the large differences in solid UV absorbance of different substances. Nano-Fe_2O_3, as a nanometal oxide, has strong absorbance for solid UV because of its small particle size and high activity. The difference in absorbance of ultrafine AP to solid UV was small owing to the properties

of ionic compounds, whereas that of $BaSO_4$ to solid UV was almost 0. The absorbance of composites to solid UV improves with increase in the dispersion of nano-Fe_2O_3, therefore the dispersity of nano-Fe_2O_3 in ultrafine AP can be qualitatively and quantitatively analyzed based on the change of absorbance. Moreover, diffusely reflected light can enter the interior of the samples and interact with the molecules through processes such as reflection, refraction, diffraction, and absorption, and therefore the structure and composition information of the samples are loaded, which is convenient for further analysis. Baseline test was performed with $BaSO_4$ as the reference sample, and then the absorbance of the samples was tested. The schematic diagram is shown in Figure S1.

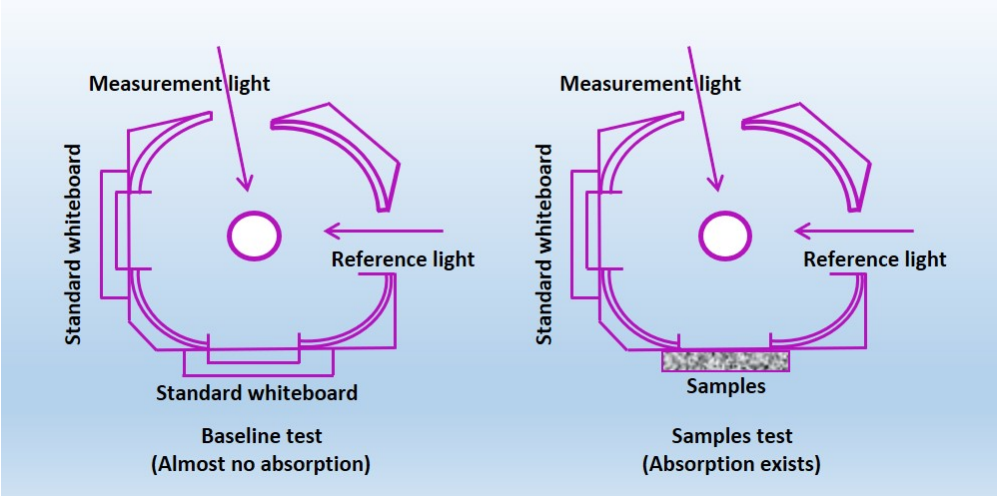

Figure S1. Schematic diagram of integrating sphere

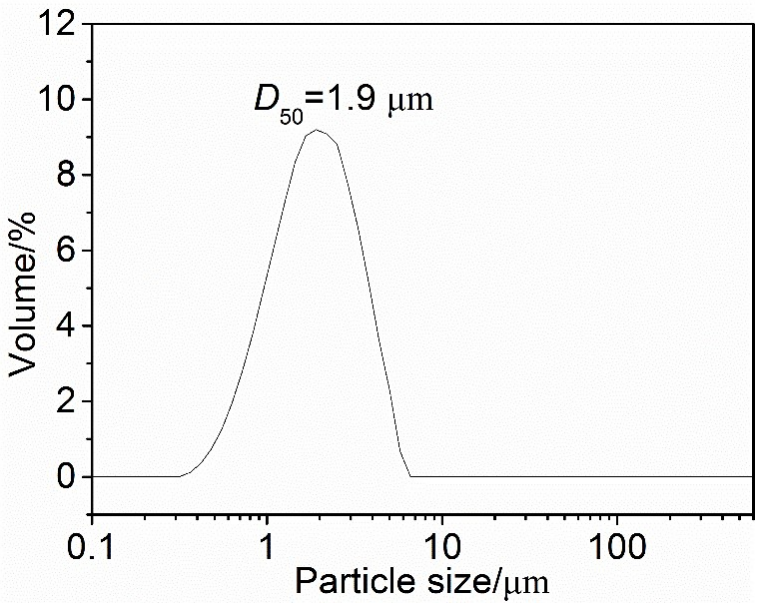

Figure S2. Particle size distribution of ultrafine AP

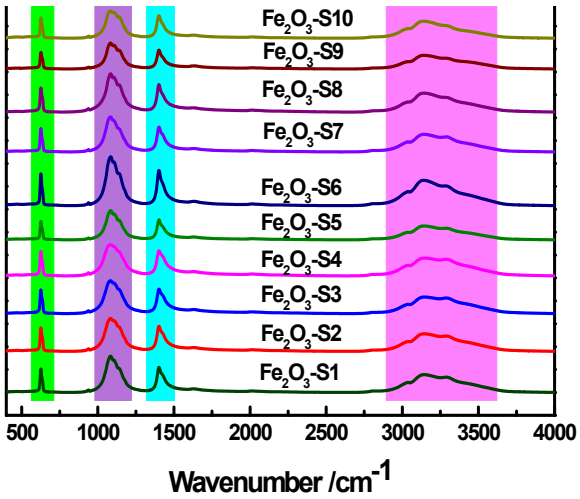

Figure S3. IR spectrum of nano-Fe_2O_3–ultrafine AP composites