

Carbonic anhydrase immobilized on octa(aminophenyl)silsesquioxane – modified magnetic nanoparticles for sequestration of CO₂

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Carbon capture and sequestration of CO₂ by carbonic anhydrase (CA) immobilized on amine functionalized magnetic nanoparticles. The amine functionalized magnetite nanoparticles were firstly prepared by co-precipitation method and grafted with octa(aminophenyl)silsesquioxane (OAPS). Surface functionalized material was characterized by FT-IR, XRD, FE-SEM, HR-TEM, EDS and TGA. The immobilization process was optimized by examining enzyme concentration, and immobilization time. The enzymatic activities of the free and immobilized CA were assessed by measuring the hydrolysis of p-nitrophenylacetate (p-NPA) and the hydration of CO₂, which was sequestered as CaCO₃. The CO₂ conversion efficiency was calculated using ion chromatography methods, and CaCO₃ formation was observed by polarized light microscopy. Thus, immobilization technique on this magnetic nanoparticle it is easy to isolate product from reaction mixture and considered to be an effective method for the capture and sequestration of CO₂.