Carbon dioxide capture using amine-impregnated mesoporous alumina

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Alumina was used for PEI (polyethylenimine) impregnation to make hybrid materials for CO_2 adsorption. The textural properties of the prepared materials before and after the impregnation were examined by XRD, N_2 adsorption-desorption isotherms and TG/TGA. CO_2 adsorption/desorption measurements were carried out using a TGA unit connected to a flow panel using high purity CO_2 gas. The alumina alone exhibited a moderate adsorption capacity at 25 ℃. After PEI impregnation, CO_2 adsorption capacity increased with the increasing of the amine loading levels until too much PEI coated on the external surface. On the scale of the amount of CO_2 adsorbed per gram PEI, the hybrid material demonstrated much higher CO_2 adsorption capacity than pure PEI, thus reflecting a significant synergetic enhancement in CO_2 adsorption capacity when PEI is distributed inside the mesoporous material. All these hybrid samples exhibited highly stable cyclic adsorption-desorption performance without losing their capturing capacities.