Breakthrough studies of Co3O4 supported activated carbon monolith for simultaneous SO2/NOx removal from flue gas

ABSTRACT

This work investigates the deposition precipitation, pore volume impregnation and hydrothermal methods of synthesizing activated carbon monolith supported metal oxide adsorbent (Co3O4/ACM). The hydrothermally synthesized Co3O4 activated carbon monolith adsorbent (Hm-Co3O4/ACM) demonstrate better adsorption capacity (SO2 is 123.1, NOx is 130.2 mg/g) than the adsorbents synthesized by the other methods. The adsorbent displayed high affinity to NOx adsorption where this influence was associated to operation conditions, physical and chemical properties of the adsorbent which were expressed in the plot of the breakthrough curve. Moreover, the surface properties (BET), thermal decomposition (TGA), functional groups (FTIR), chemical composition (XRD) and surface morphology (FESEM) of the adsorbent were investigated. The Langmuir adsorption isotherm fitted the experimental results meanwhile, the thermal regeneration of the adsorbent over two cycles showed an average regeneration efficiency of 94.4% for SO2 and 94.8% for NOx. Finally, the post regeneration characterization analyses were discussed.

Keyword: Activated carbon monolith; Breakthrough curves; Environment; Synthesis; Flue gas