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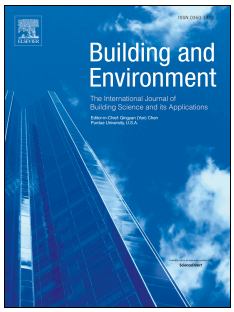

Experimental and simulation studies on dust loading performance of a novel electrostatic precipitator with dielectric barrier electrodes

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Abstract

A novel electrostatic precipitator for indoor air cleaning with dielectric barrier electrodes which enables providing effective control of indoor particulate matter has been investigated in this paper. It consists of precharger and dust collector in which charged particles are trapped. The detailed configuration of the novel ESP has been discussed and the performance experiments during different dust loading period were carried out. The experimental results show that initial pressure drops under face velocities of 1.0m/s and 2.5m/s are as low as 14Pa and 60Pa and initial collection efficiency of $PM_{2.5}$ are 99.8% and 97.6%, respectively. The first 40 dust loading days, $PM_{2.5}$ efficiency maintains as high as over 90% under face velocity of 1.0m/s while $PM_{2.5}$ efficiency under 2.5m/s velocity can only keep around over 50% at the end of 50 days. The flow field, electric field and particle trajectory within one single dust collecting channel were simulated using COMSOL software. The simulation results show that flow field stays unchanged while electric field has been weakened due to accumulated charged particles on the surface of collecting electrode after a period of dust loading which means a particle trapping capability cut-off and a decrease on