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Novel application of cotton stalk as a waste derived catalyst in the low temperature SCR-deNO_x process

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Abstract

The use of activated carbon derived from cotton stalk as a potential catalytic support material in the application of NO removal from coal combusted flue gas was experimentally investigated utilising the SCR-deNO_x process. Cotton stalk samples infused with phosphoric acid were chemically activated (CACS) and co-activated (CO-ACS) and impregnated with the metal configuration Mn/Ce (1:2 M ratio) representing 4 wt.% relative to the support material. The $CACS_x$–Mn/Ce and CO-ACS_x–Mn/Ce catalysts provided NO conversion efficiencies ranging between 10% and 68%. The addition of phosphoric acid significantly increased the BET surface area (m^2g^{-1}) of the respective $CACS_x$–Mn/Ce and CO-ACS_x–Mn/Ce catalysts. However based on the experimental and analytical findings this study suggests that the NO conversions efficiencies of the $CACS_x$–Mn/Ce and CO-ACS_x–Mn/Ce catalysts are far more dependent on the wt.% of the metal loading than the physical parameters such as the pore size, pore structure and surface area. The relatively lower NO conversion efficiencies may also be further due to the neutralisation of the Lewis and Brönsted acid sites of the catalysts by the presence of any alkali metals within the cotton stalk. The cotton stalk derived catalytic support has shown a great potential for possible application within the SCR-deNO_x process. It is further suggested that higher NO conversion efficiencies can be realized by an increase in the metal loadings of Mn/Ce for the $CACS_x$–Mn/Ce and CO-ACS_x–Mn/Ce catalysts.

Biography

Surjit Singh completed his PhD in combustion engineering at the age of 30 years from the University of Leeds, UK. He has subsequent industrial experience in the area of solid fuel combustion under air and oxy firing conditions. Presently he holds the position of a post-doctoral research fellow at the University of Leeds, UK. His areas of research include pollution control from thermochemical processes and novel production of catalysts from waste. He has successfully published more than 20 papers in reputed journals.