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Towards hollow fibers automotive catalytic converters: Effect of carbon on the NO abatement efficiency of Cu decorated C/Al₂O₃ porous hollow fibers

In this work, biopolymer/ceramic hollow fibers were manufactured at high yield using a modified polyol process in spinneret set-up and allowed to adsorb controllable amounts of Cu²⁺. The fibers were further converted to catalytic Cu decorated, carbon/ceramic composite hollow fibers (C/Al₂O₃) by a post-sintering technique. The polyol process modification pertained to the use of alginate as the metal ion binder and metallic nanoparticles stabilizer. The walls of the hollow fibers were porous, exposing a high surface area decorated with Cu nanoparticles. The structural and morphological properties of the obtained catalytic composite hollow fibers have been studied and their DeNO_x abatement efficiency has been evaluated via continuous flow process we propose here, with the gas stream sweeping the shell and lumen side of a bundle of the fibers in the tangential flow mode. The stability, long working-life and easy regeneration of the composite catalytic fibers were studied in relation to the carbonaceous content and the possible deactivation/reactivation mechanisms. It has been concluded that carbon contributed significantly to the improvement of the DeNO_x activity, especially in the cases, where reducing gases such as CO were absent from the gas stream. Moreover, the DeNO_x efficiency was high and stable for more than 300 hours on stream, a feature which combined with the viability in terms of manufacturability and yield, makes us propose these catalytic fibers and the respective bundle type reactor as the next generation technology for NO abatement.

Biography

Iakovos Yakoumis has obtained his MSc degree in Chemical Engineering from the National Technical University of Athens in 1997. He has published 14 research papers in international scientific journals. He is the Founder and the Managing Director of Monolithos Catalysts and Recycling Ltd. In 2000, he was honored for the Organization of the Greek Small and Medium Enterprises with the Panhellenic Award of the Best Young Businessman of the Year. He was a Member of the Board of several local and business associations. He has served as an elected Vice-President of the City Council of Naxos and Small Cyclades Municipality (2014).

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