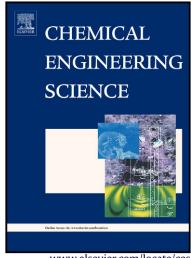
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ACCEPTED MANUSCRIPT

Yeast cells as macropore bio-templates enhancing transport properties and conversions in coated catalyst layers for exhaust gas oxidation

Marek Václavík ^a, Michal Dudák ^a, Vladimír Novák ^a, Rostislav Medlín ^b, František Štěpánek ^{a,b}, Miloš Marek ^{a,b}, Petr Kočí ^{a,b,*}

^a Institute of Chemical Technology, Prague, Department of Chemical Engineering, Technická 5, Prague 166 28, Czech Republic

^b New Technologies Research Centre, University of West Bohemia, Univerzitní 8, Pilsen 306 14, Czech Republic

* corresponding author, e-mail: petr.koci@vscht.cz

Keywords: washcoat; porous catalyst design; 3D structure formation; diffusion; mathematical modeling; automotive exhaust gas aftertreatment

ABSTRACT

We propose an application of yeast cells as alternative, ecological and economical material for macropore templates that enhance transport properties and conversions in multiple coated catalyst layers. The grown bakers' yeast cells exhibit a suitable, naturally uniform size, are cheap and readily removable from the layer upon calcination. Their application is demonstrated in Pt/γ - Al_2O_3 layers typically used in exhaust gas oxidation catalysts. The layers coated with and without yeast cells are compared by the means of porosimetry, cross-section SEM images and lab reactor tests for CO oxidation. Porous layers formation is simulated in 3D and multi-scale model is used to predict effective diffusivity and conversions of CO in the coatings. The model predictions agree well with lab reactor tests and clearly demonstrate improved transport properties and conversions in multiple layers configuration with additional macropores resulting from the yeast cell templates.

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