

MILLIMATRIX

Millimeter reactors with micro-structured-Matrix

for multi-phase catalytic reactions

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David Edouard*, Principal investigator, Laboratoire des Matériaux, Surfaces et Procédés pour la Catalyse (LMSPC), CNRS-UMR 7515 –Université de Strasbourg, 25, rue Becquerel, 67087 Strasbourg.

Meryem Saber, Post-doc student, LMSPC.

Thierry Romero, Technician CNRS, LMSPC

Pascal Fongarland, Institut de Recherches sur la Catalyse et l'Environnement de Lyon (IRCE), CNRS – Université Claude-Bernard Lyon 1, 2 avenue Albert Einstein, F-69626 Villeurbanne.

Concept and objectives

The project consists of developing a new generation of multi-scale structured reactor for G or G-L reactions. The **MILLIMATRIX** structured reactor (Fig. 1) is based on millimeter reactor volume filled by a micro cellular matrix (β -SiC foam with or without addition of nanofibers). The originality of this project is that the specific surface area value (S/V) will be increased not by reducing the size of reactor channel - but by introducing a nano/micro cellular matrix previously coated with a catalytic phase (i.e. using directly *ex-situ* the 'conventional' techniques of active phase deposition). The tunable morphology of the solid foam will ensure a good heat and mass transfer.

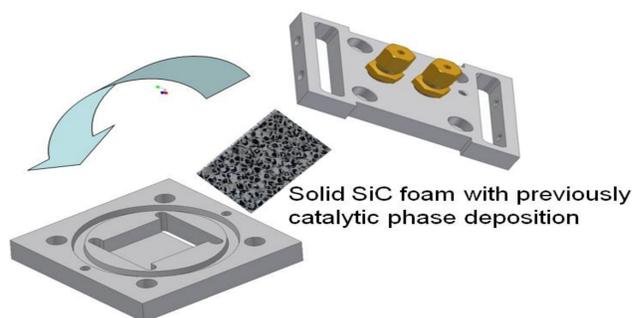


Fig 1. Millimatrix Structured Reactor

Characterization of the Millimatrix reactors.

Different configurations of Millimatrix structured reactor (Fig. 2) are developed in order to characterized the following steps:

- The pressure drop [1]
- The phenomenon radial and axial dispersion [2,3]
- The effective thermal conductivity [4,5]
- The catalytic active phase coating.

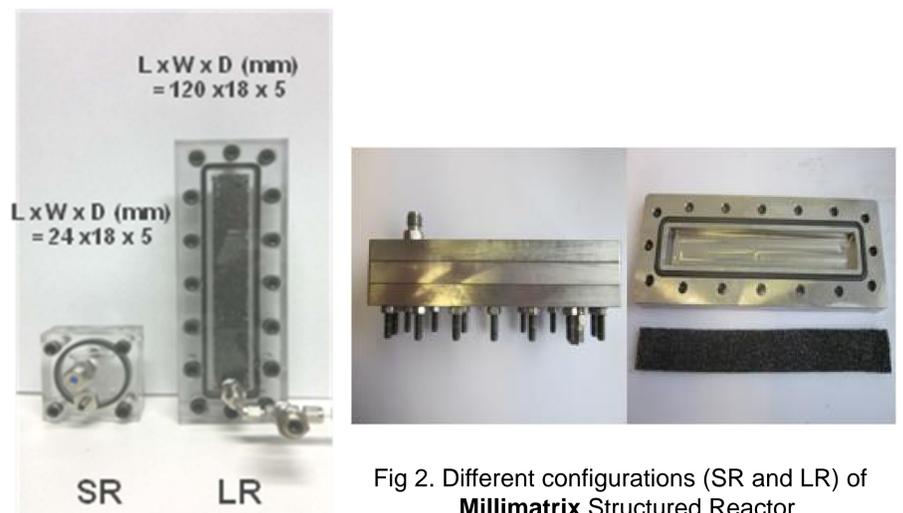


Fig 2. Different configurations (SR and LR) of Millimatrix Structured Reactor

Catalytic tests

In the frame of this project, both model reactions and multi-phase reactions are tested in order to compare the Millimatrix structured reactor with the 'conventional' fixed bed in the following reactions:

- Catalytic (Pt) oxidation of formic acid (model reaction)
- Methanol dehydration to dimethyl ether over H-ZSM5 [6]
- Catalytic (Co) Fischer Tropsch Synthesis [7].

Perspectives

- Thermal characterization of the Millimatrix reactor filled by a hairy foam (open cell foam + carbon nanotube).
- Optimization of the Millimatrix reactor for the methanation of carbon dioxide reaction conditions.

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CONTACT : edouardd@unistra.fr

David Edouard, Laboratoire des Matériaux, Surfaces et Procédés pour la Catalyse, Groupe Génie Chimique, ECPM Strasbourg.

