

# 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 ( $\beta$ -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.

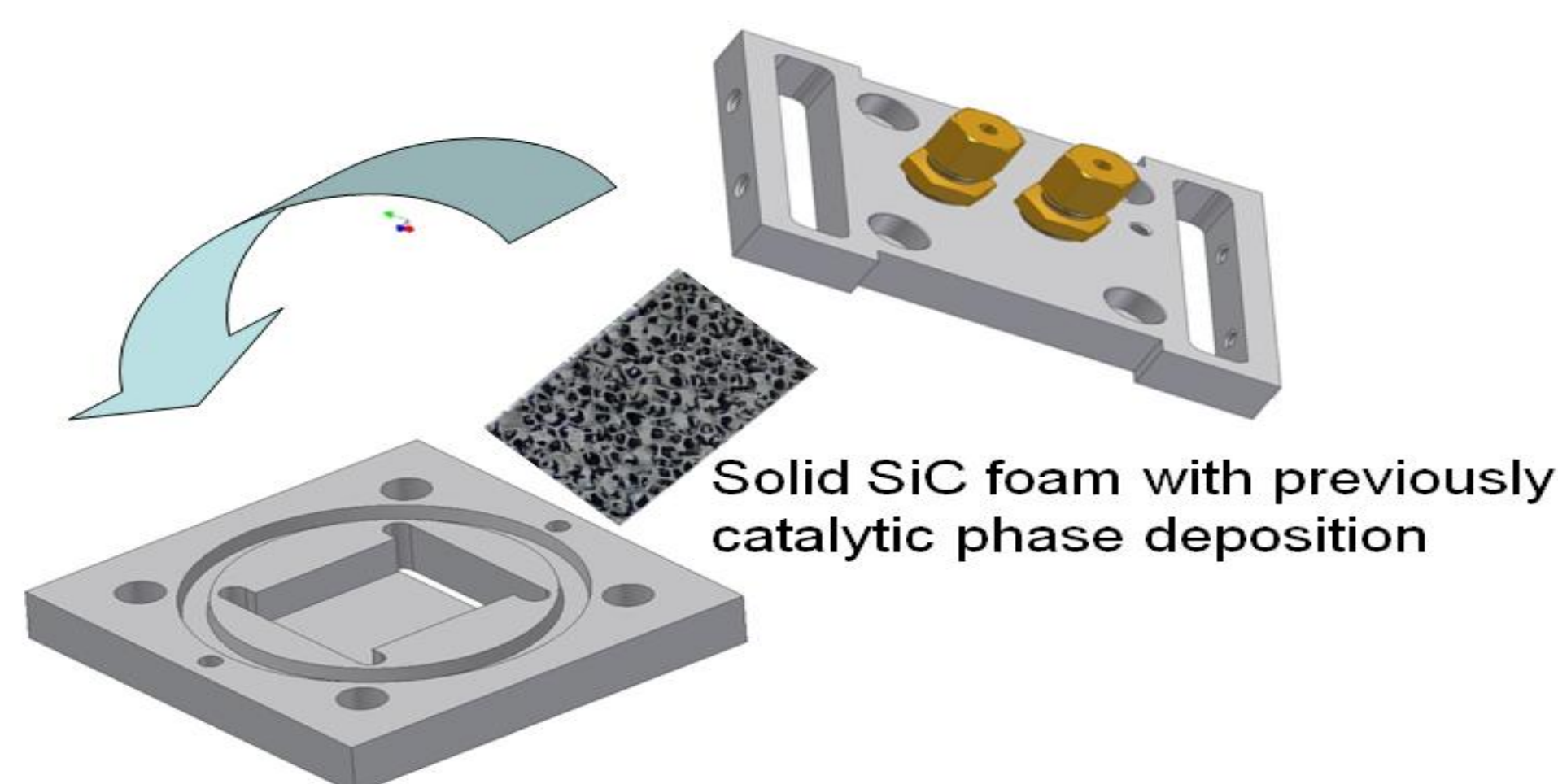


Fig 1. Millimatrix Structured Reactor

### 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.

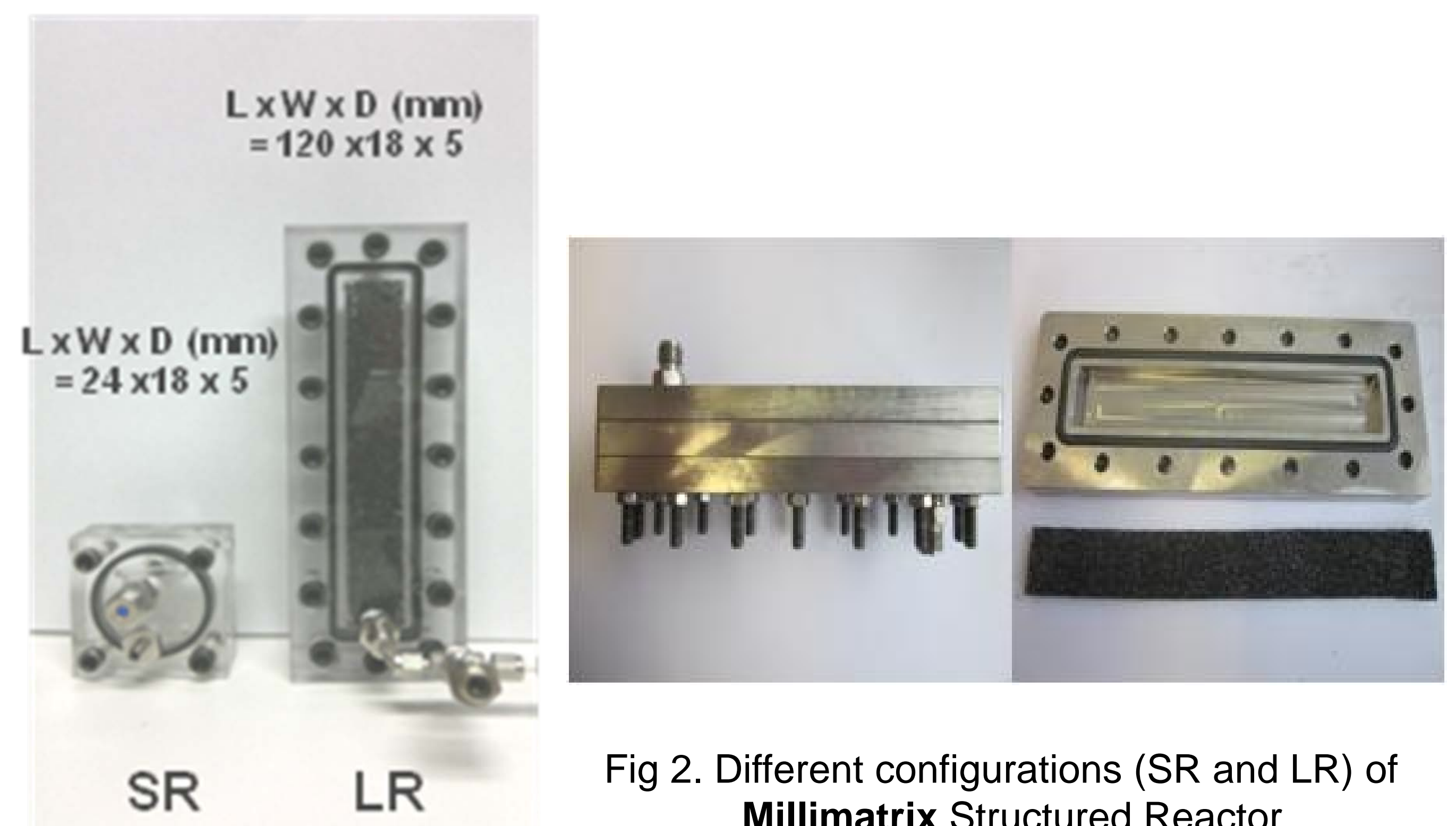


Fig 2. Different configurations (SR and LR) of Millimatrix Structured Reactor

### 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.

