Institute of Chemical Engineering

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Design and additive manufacturing of new high-performance structural catalysts for environmentally friendly hydrogen sulfide utilization

Duration: 2021 - 2026
Description

NCN - OPUS 19, UMO-2020/37/B/ST8/02859

The aim of the project is to develop efficient method of hydrogen sulfide utilisation by catalytic combustion by using a concept of ceramic structured reactors obtained by additive 3D manufacturing popularly called 3D printing. The most popular structured reactors made of channels are the ceramic monoliths which are commonly used in the chemical and automotive industry for pollution control. An idea of structured chemical reactors can be expanded to well defined 3D structure. Our purpose is to be able to design them at the same level of sophistication at which microprocessors are designed and combined into complex electronic systems used for computational purposes. It seems that, in comparison with electronics, chemical engineering is lagging substantially behind. In this way this project is a logical reaction to the urgent need to develop a new strategy for reactor design, in which packed beds; still the most widespread reactor types,

are replaced by structures designed down to the molecular level. This can be achieved by engaging the techniques of additive manufacturing. While 3D printing is fairly well-developed for plastics with better or worse quality depending on the purpose, it still needs a lot of surveys as far as ceramics is regarded. Ceramics is the most advantageous material for the reactor structured internal. An ultimate goal, however, would be to imprint catalyst material, or more precisely, the active centres on top of such structures with use of additive manufacturing methods. This can be achieved provided that their structure is known at a molecular level at which the reactants molecules meet on catalyst surface and react. This is possible provided that advanced methods of in situ spectroscopic investigation of the surface will be engaged which is the main chemical analytical tool in our project.

Tagi: additive manufacturing, h2s utilization, structural catalysts, cfd

Metryczka

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