Engineering of 3D printed catalytic reactors

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The impact of digital fabrication on the field of catalytic technology and chemical engineering is steadily increasing. Additive manufacturing, also referred to as 3D printing, closes the gap between theory and experiment, by enabling accurate fabrication of geometries optimized through modelling and the experimental evaluation of their properties. This rapid and seamless transition between digital data and physical objects will be of increasing value in streamlining both research and manufacture of reactors and structured catalysts, enabling creative contributions from researchers with a core expertise in fields such as catalytic technology and chemical engineering. The introduction of flow chemistry at the lab scale would enable the exploration and scale-up of a broader range of synthesis conditions (e.g. not deemed safe in batch reactors) and therefore enable protocols and products currently not accessible at the production scale.
Nevertheless, improvements are still needed, for instance in decreasing printing costs, controlling the surface roughness of reactor internals, standards and standardized test protocols, etc. A broader impact of 3D printing in reaction engineering would be facilitated as well by increasing the thermal and chemical compatibility of the build materials.
The goal of this contribution is to highlight the interaction at the crossroads of chemistry, materials science, and reactor engineering to implement digital fabrication in the field of catalytic technology and chemical engineering.