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Abstract

Efficient Topological and morphological characterization of 3D complex microstructures

Abstract: Porous media characterization is central for heterogeneous catalysis for the production of biofuels and chemical intermediates by biomass transformation. Their description should provide certain connection to some of their physicochemical properties, and concerning their activity or selectivity.Standard geometric descriptions, such as porous volume fraction, granulometry of pores, or specific surface area, are seldom sufficient for this purpose. This is why we have developed new morphological and topological descriptors using the so-called “distance transform” with adapted time-efficient numerical methods. The present work is a global attempt to provide a realistic description of the microstructure of porous media; it should help to define an optimal microstructure modelization taking into account intended textural and usage properties. Such a description can also lead to a structural classification of porous media. We will present a first approach addressing the ability for given particle’s sizes to go through the porous network until a critical radius. Then, we will define a new versatile tortuosity descriptor based on the travel distance of a particle in a porous maze. The computation of these new descriptors will be shown using plug im!, a signal and image processing open access software, on several types of porous media such as zeolites, metal-organic frameworks and alumina catalyst supports.

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