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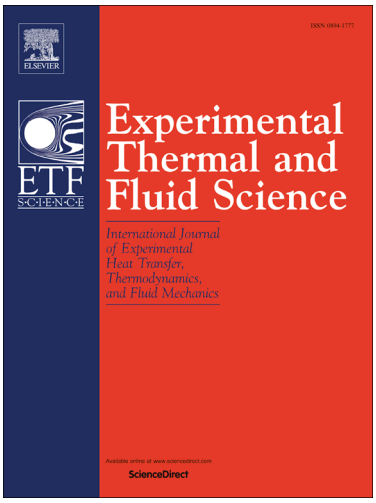

Experimental transient clogging of brass porous disks by silicium particles

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Experimental transient clogging of brass porous disks by silicium particles

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EXPERIMENTAL TRANSIENT CLOGGING OF BRASS POROUS DISKS BY SILICIUM PARTICLES

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Highlights

- An innovative test bench to study the transient clogging of porous material is proposed.
- A stable test configuration used three particle diameters during transient tests.
- The impact of particle transport on the material's properties (porosity, permeability) was quantified.
- A good correlation was found between theoretical results from the Carman-Kozeny law and those from experiments.

Abstract

Transpiration cooling by hydrocarbon fuel can be used to lower the temperature of the combustion chamber walls in high-speed engines such as Ramjet engines. Due to the high thermal load to be evacuated, the coking activity caused by the pyrolysis undergone by the fuel forms a number of high carbon content micro-particles that block the porous walls of the combustor. When the porous material is clogged by the particles, the cooling efficiency decreases, damaging the walls. In the present study, the transport of particles through a porous material was investigated in order to quantify its impact on clogging. To do so, three different sizes of particles (mean diameters of 35 μm, 42 μm and 50 μm) were injected into a water suspension at a constant pressure in a permeation cell containing the porous medium. The transient variations of the material's permeability were observed and correlated through the change in porosity with the particles deposited on the upstream surface of the material and accumulated inside the void volume of the porous medium. The particles' sizes directly impacted the dynamic of clogging and its magnitude. The Carman-Kozeny correlation

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