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by

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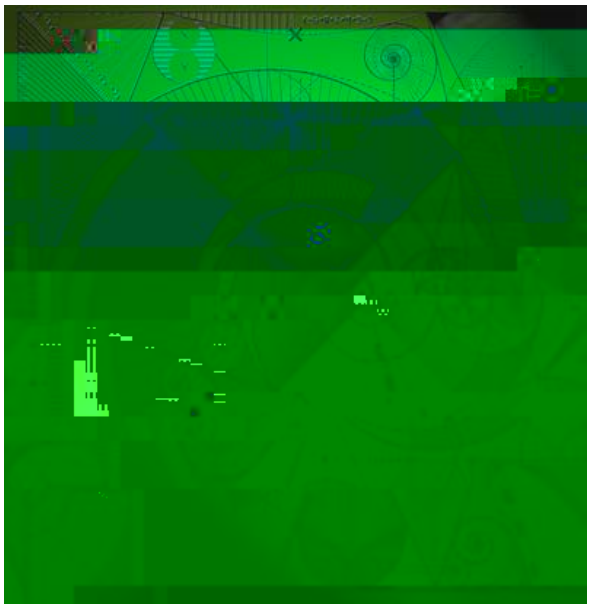

Superfast non-linear di□usion in porous media: new regimes, universal model and power laws.

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Abstract

The migration of liquids driven by capillary forces in passage networks of porous media, such as sand, has been commonly considered at saturation levels relevant to pore dimensions. In this letter we reveal a very-low-saturation regime where the relevant length scales of the transport mechanics are defined by the grain roughness

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the granular medium we use Standard Ottawa Sand (EMD Chemicals, Inc., p/n SX0075); it has an average grain size of 250 μm, porosity of 30% and surface roughness in the range $0.25 < \Delta R_0 < 3\,\mu$

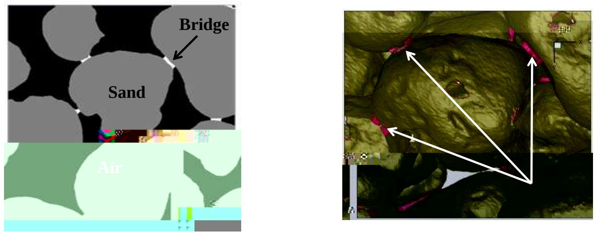

Figure 1: Illustration of isolated bridges at low levels of saturations. (a) MicroXCT image, typical from our experiments. (b) 3D image reconstruction of MicroXCT data. The liquid within the roughness of the sand grains,
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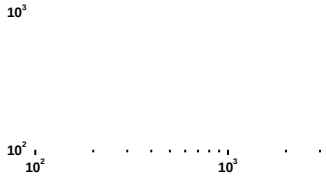
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