

Microstructure reconstruction of sandstone and limestone by grains deposit - application for CO₂ geological storage

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The carbon capture and storage is considered as one of the solutions of reducing the effects of global warming. It consists in injecting large quantities of CO₂ in supercritical form directly into deeply located geological formations. One of the methods involves sequestration in the carbonate sedimentary rocks (sandstones and limestones) which are considered as a promising solution.

The morphology of the pore network and solid skeleton defines important macroscopic properties of the rock (permeability, stiffness). Modelling at micro scale of random heterogeneous materials (porous media) should be based on morphological and statistical characterisation^{1,2} of the investigated microstructure.

The work is focused on a reconstruction method by grains deposit³, for various range of parameters, to obtain equivalent model of natural rock samples (oolitic limestone and fontainebleau sandstone). Generated samples satisfy morphological and statistical informations⁴ which were obtained by 3D image analysis of X-ray tomography of the natural rock samples. For validation of the modelling numerical computations of mechanical and transfer properties are also provided.

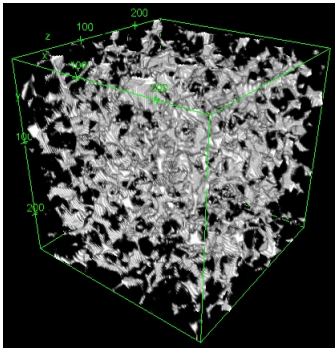


Figure 1: Real porous network of fontainebleau sandstone.

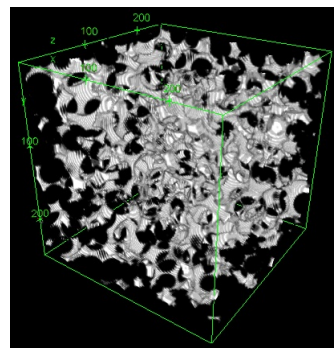


Figure 2: Generated porous network of sandstone.

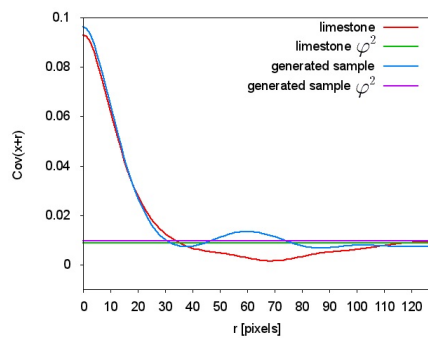


Figure 3: Averaged horizontal covariance of real and generated limestone.

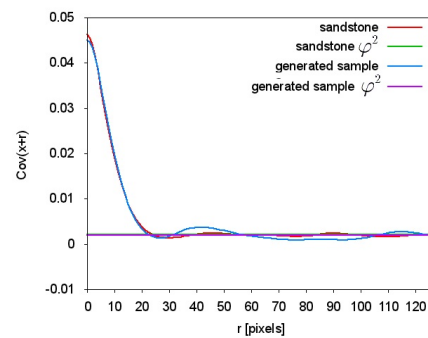


Figure 4: Averaged horizontal covariance of real and generated sandstone.

¹Torquato, *Random Heterogeneous Materials*, New-York: Springer-Verlag (2002)

²Jeulin, *Statistics and Computing*, **10**, 121, (2000)

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