

08.04: Compression Behavior of Smectitic vs. Illitic mudrocks

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ABSTRACT

To study the mechanical change of GoM-EI mudrock resulting from the smectite-to-illite transformation, I conducted two tests for comparison: original vs. cooked material.

The original smectitic material was cooked in the reactor under 250C for 18 days with 3 mol/L KCl. This temperature and time setting creates a high degree of conversion. The cooked material was resedimented in 3mol/L KCl and tested in CRS compression device.

From CRS test results, the hydrothermal treatment of GoM-EI increases porosity at a given effective stress and increases permeability at a given porosity. At higher stress, the RGoM-EI (red curve) and the RGoM-EI cooked (blue curve) converge (Fig.1).

Both the original and the cooked GoM-EI were compressed to 100MPa. Their gravimetric porosity are about the same value, but based on SEM images (Fig. 2), the cooked material has larger observable pore space. The clay aggregates of the cooked are smaller in size, and have more edge to face contact giving the material a stronger structure and less flow resistance.

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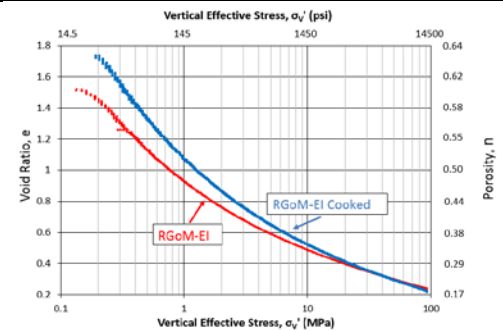


Fig 1: Compression curves of the cooked (blue) and original (red) GoM-EI material. The hydrothermal treatment of the original GoM-EI converts smectite to illite/smectite mix-layered particle. The cooked material has a higher porosity at a given effective stress.

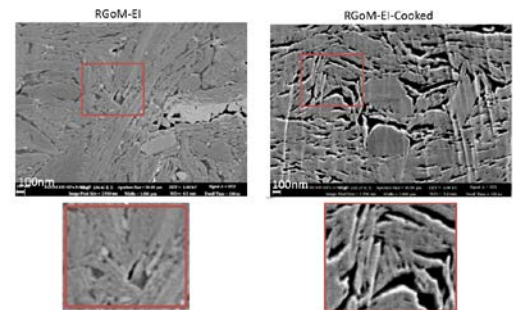


Fig 2: Samples were oven dried and ion milled before imaging. Their gravimetric porosity are of same value, but based on SEM images (Fig. 2), the cooked has larger pore space. The clay aggregates of the cooked are smaller in size, and have more edge to face contact giving the material a stronger structure. (Photo courtesy of Dr. Deirieh)

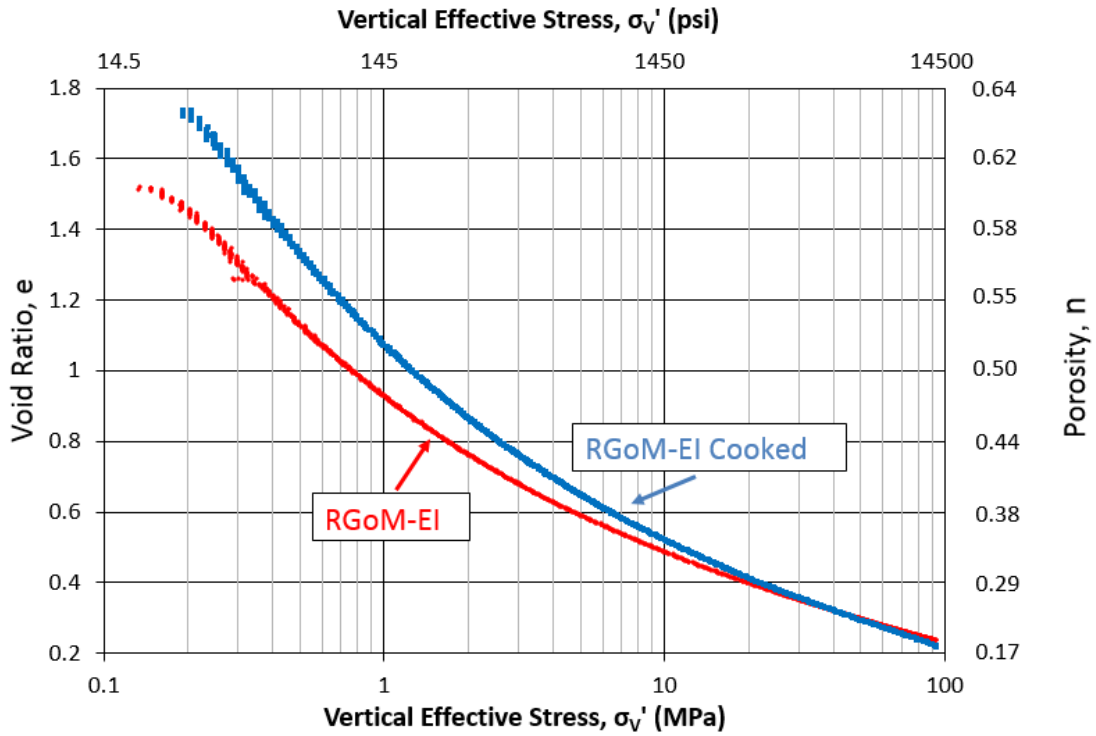


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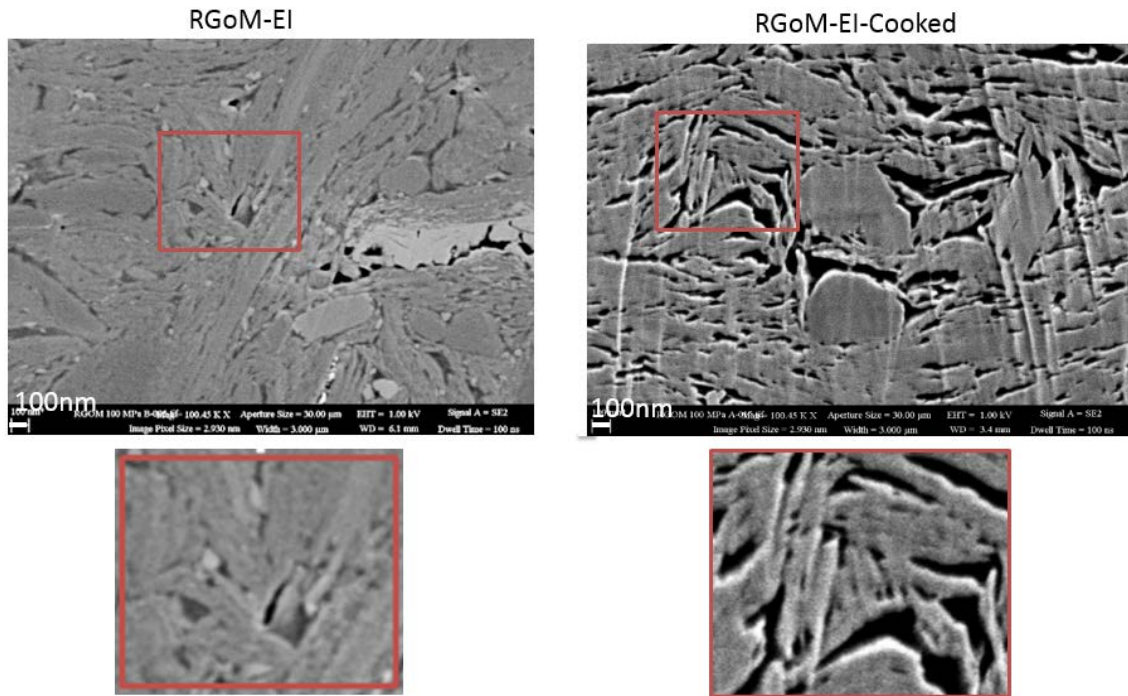


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