

Cryogenic and oven dried imaging of Mudrock Fabric
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ABSTRACT

I show that oven drying changes the microstructure of Resedimented Gulf of Mexico samples (RGOM). Images show that the porosity of oven-dried RGOM samples is less than that of wet RGOM samples. This difference is caused by the collapse of fine clay particles to form denser microstructure (See Fig. 1 and 2). Furthermore, RGOM samples undergo dramatic shrinkage when oven dried. Shrinkage ranges from 50 % at 0.2 MPa to 20 % at 65 MPa. Also, I show that the majority of drying shrinkage occurs in the nanometer-sized clay porosity by comparing SEM images of oven-dried and wet RGOM samples. I use conventional SEM to image ion-milled oven-dried samples, and cryo-SEM to image ion-milled wet samples. The ion-milling of wet samples was made possible by using a recently developed state-of-the-art cryo polisher. These results will have a significant influence on materials characterization given that the majority of characterization methods require materials to be dried, which may alter the microstructure.

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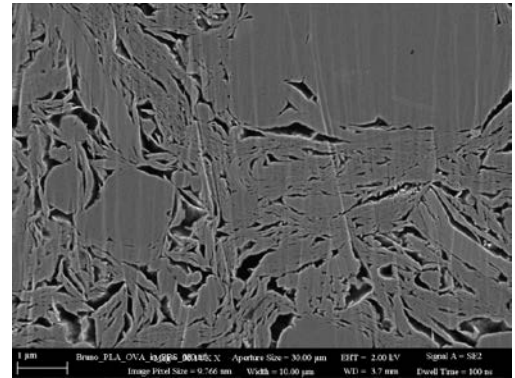


Fig. 1: SEM image of a vertical section of a Resedimented Gulf of Mexico (RGOM) sample at 1 MPa. The image shows clay particles and pore space. The sample was oven dried and ion milled prior to imaging. The image was segmented to separate the pore space and particles for further analysis.

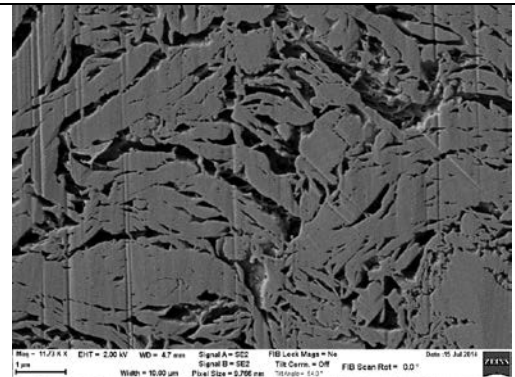


Fig. 2: Cryo-SEM image of a vertical section of a Resedimented Gulf of Mexico (GOM) sample at 1 MPa. The image shows clay particles and pore space. The sample was frozen in liquid nitrogen, ion milled and imaged under cryo-conditions. The image was segmented to separate the pore space and particles for further analysis.

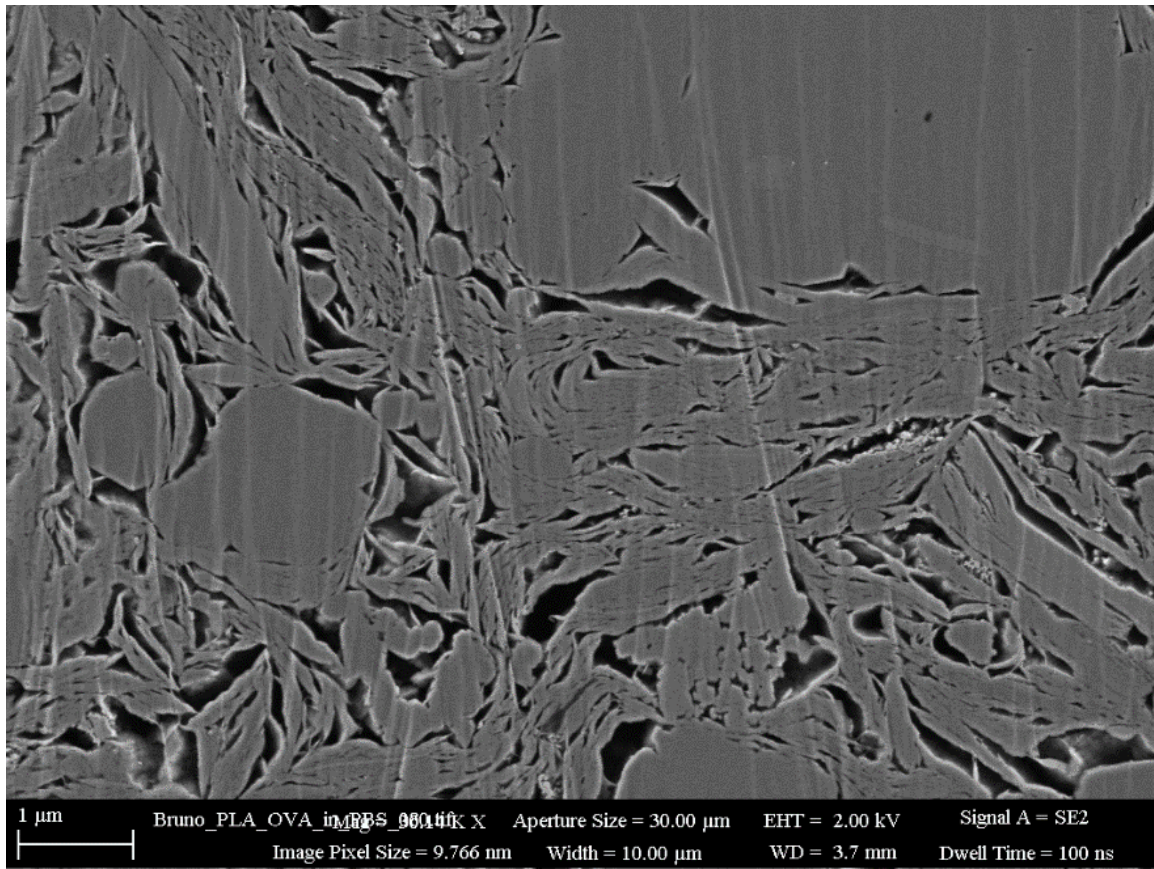


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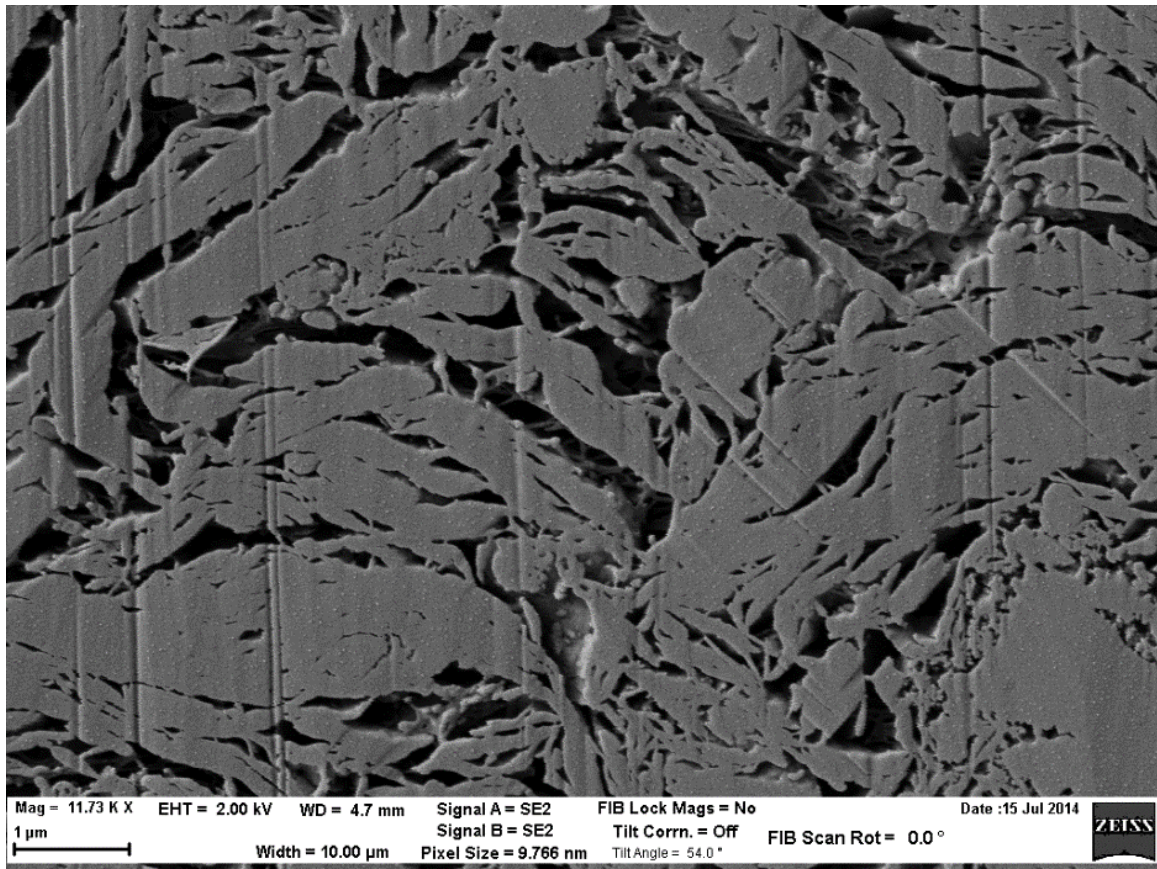


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