Data Report: High-Resolution Microscopy Images of Sediments from Green Canyon Block 955, Gulf of Mexico¹

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1. Abstract

We took Leica microscopy images of sediment samples acquired at Holes H002 (4 samples) and H005 (1 sample) during the UT-GOM2-1 Expedition in Green Canyon Block 955, in the northern Gulf of Mexico. A total of 37 images were acquired. The images document a prevalence of spherical conchoidal minerals, cleavage planes typical of feldspar or mica, and black fragmented minerals which stand out from the surrounding matrix. Drilling mud intrusion is thought to contribute to a grey metallic matrix observed across multiple samples.

2. Introduction

The objective of this report is to present data and results of high-resolution microscopy image analysis on samples collected during the UT-GOM2-1 Expedition (Flemings et al. 2018). For this analysis, a digital light microscope provided detailed high-resolution images of sediment components that surpasses the resolution of the naked eye. Such images complement mineral identification analysis carried out using x-ray diffraction (XRD), which is reported in Heber et al., 2019.

The UT-GOM2-1 Expedition in May, 2017 drilled two holes in Green Canyon Block 955 (GC 955) in the deepwater Gulf of Mexico: Hole GC 955 H002 (H002) and Hole GC 955 H005 (H005). 21 10 ft (3.05 m)

¹Heber, R., Cook, A., Sheets, J., Sawyer, 2020. Data Report: High-Resolution Microscopy Images of Sediments from Green Canyon Block 955, Gulf of Mexico. In Flemings, P.B., Phillips, S.C, Collett, T., Cook, A., Boswell, R., and the UT-GOM2-1 Expedition Scientists, Proceedings of the UT-GOM2-1 Hydrate Pressure Coring Expedition: Austin, TX (University of Texas Institute for Geophysics, TX). 6 p.

Initial receipt: 26 Sept 2019 Acceptance: 08 October 2019 Publication: 20 May 2020 Corresponding Author: Ann Cook <u>cook.1129@osu.edu</u> Volume: <u>https://dx.doi.org/10.2172/1646019</u> <u>https://ig.utexas.edu/energy/genesis-of-methane-hydrate-in-coarse-grained-systems/expedition-ut-gom2-1/reports/</u> pressure cores were attempted in, and near, the methane hydrate reservoir (Flemings et al., 2018). In the first hole, H002, 1 of the 8 cores was recovered under pressure with 34% recovery of sediment (both pressurized and depressurized). In the second hole, H005, 12 of the 13 cores were recovered under pressure with 72% recovery of sediment. The pressure cores were imaged and logged under pressure.

Depressurized sediment analyzed were either from pressure cores that were not recovered under pressure or from pressure cores quantitatively degassed either on-board or on-shore to determine the hydrate concentration and the gas composition. To document high-resolution microscopy, we used a Leica DMS1000 digital light microscope. Leica is a microsystems company specializing in optical precision instruments.

3. Methods and Materials

Photomicrographs were acquired using a Leica DMS1000 digital light microscope. Both wet and dry subsamples were taken from loose sediment sections of split cores before being bagged (Table 1). The subsamples were spread out into thin layers on a white sheet of paper and observed under 50x magnification. All of the uploaded low-resolution versions (2.3 MB) of the images have a 1 mm scale bar. The higher-resolution versions are equivalent in scale to the lower-resolution version but do not have the embedded scale bar to allow for unobstructed image processing.

4. Results

Leica images reveal an abundance of spherical conchoidal minerals characteristic of quartz (Figure 1), cleavage planes characteristic of both feldspars and micas, and a smattering of black minerals stands out from the rest of the sediment (Figure 2). Moreover, a matrix with a dull metallic luster filling the space between grains in an amorphous pattern, can be seen in multiple images (H002-7CS-1 image 2, H002-6CS-3 image 6) which may be consistent with drilling mud intrusion (Figure 1).

A complete set of images is available in the following directories and listed in Table 2:

H002: http://www-udc.ig.utexas.edu/gom2/H002/6_Lithostratigraphy/Leica/

H005: http://www-udc.ig.utexas.edu/gom2/H005/6_Lithostratigraphy/Leica/

5. Acknowledgements

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6. References

Flemings, P.B., Phillips, S.C, Collett, T., Cook, A., Boswell, R., and the UT-GOM2-1 Expedition Scientists, 2018. UT-GOM2-1 Hydrate Pressure Coring Expedition Summary. In Flemings, P.B., Phillips, S.C, Collett, T., Cook, A., Boswell, R., and the UT-GOM2-1 Expedition Scientists, Proceedings of the UT-GOM2-1 Hydrate Pressure Coring Expedition: Austin, TX (University of Texas Institute for Geophysics, TX). https://ig.utexas.edu/energy/genesis-of-methane-hydrate-in-coarse-grained-systems/expedition-ut-gom2-1/reports/

Heber, R., Cook, A., Sheets, J., and Sawyer, D., 2020. Data Report: X-Ray Diffraction of Sediments from Green Canyon Block 955, Gulf of Mexico. In Flemings, P.B., Phillips, S.C, Collett, T., Cook, A., Boswell, R., and the UT-GOM2-1 Expedition Scientists, Proceedings of the UT-GOM2-1 Hydrate Pressure Coring Expedition: Austin, TX (University of Texas Institute for Geophysics, TX). http://dx.doi.org/10.2172/1648308, 27 p.

7. Figures



Figure 1. Leica microscope image of H002-7CS-1 (wet sample). Note grey metallic fluid between grains is likely drilling mud.



Figure 2. Leica microscope image of H002-2CS-1. Note black minerals.

8. Tables

Table 1. Subsamples taken from Ohio State cores after splitting or bagging.

Subsample	Interval
H002-6CS-2	Bagged loose sediment
H002-6CS-3	Bagged loose sediment
H002-7CS-1	Bagged loose sediment
H002-8CS-2	Bagged loose sediment
H005-9FB-4	Bagged loose sediment

Table 2. List of original images available for download at:

H002: http://www-udc.ig.utexas.edu/gom2/H002/6_Lithostratigraphy/Leica/ H005: http://www-udc.ig.utexas.edu/gom2/H005/6_Lithostratigraphy/Leica/

Image H002-6CS-2(image1) H002-6CS-2(image2) H002-6CS-2(image3) H002-6CS-2(image4) H002-6CS-2(image5) H002-6CS-2(image6) H002-6CS-3(image1) H002-6CS-3(image2) H002-6CS-3(image3) H002-6CS-3(image4) H002-6CS-3(image5) H002-6CS-3(image6) H002-6CS-3(image7) H002-6CS-3(image8) H002-7CS-1(image1) H002-7CS-1(image2) H002-7CS-1(image3) H002-7CS-1(image4) H002-8CS-2(image1) H002-8CS-2(image2) H002-8CS-2(image3) H002-8CS-2(image4) H002-8CS-2(image5) H002-8CS-2(image6) H002-8CS-2(image7) H002-8CS-2(image8) H002-8CS-2(image9) H002-8CS-2(image10) H002-8CS-2(image11) H005-9FB-4(image1) H005-9FB-4(image2) H005-9FB-4(image3) H005-9FB-4(image4) H005-9FB-4(image5) H005-9FB-4(image6) H005-9FB-4(image7) H005-9FB-4(image8)