



Core Mineralogy, Inc.
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Company: Javeler Marine Services, LLC.
Attention: Eric Wingate, Jared Vige

Date: 5/10/2017
CMI File# 17030701

Deep Water Dredging Sample

Estimation of Material Properties Based on Limited Compressive Resistance to Failure and the Mineral Composition

Mr. Rahmatian of the Core Mineralogy, Inc supplied us with a set of data showing simple Uniaxial Compressive Resistance to Failure, a Photo of failed material, and some XRD data detailing mineralogical composition of the same. With this data, he asked for our opinion on the Compressive, Shearing Resistance of this Sea Floor material, and the qualitative Chemo-mechanical properties of the clayey material. Our opinion is as follows:

1. Based on a simple failure criterion we estimate the Shearing resistance to Failure is approximately 47.5 PSI and intrinsic Cohesive strength is approximately 33 PSI, all based on 95 PSI maximum compressive resistance to failure and the way the material mass has failed under the Compressive load.
2. Based on the XRD pattern (presence of Low Gibbs free Energy Kaolinite and other clays) and presence of a considerable amount of Hematite, (2%), and Calcite, (14%), there appears to be a cause for Kaolinite to react with iron and calcite and convert to "saproliite". The chemo-mechanical consequence of this conversion shows up in the increased shear resistance of material which is very high when compared with the material resistance to maximum compressive stress at failure, (95 PSI).

Sincerely,

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**Estimated Compressive And Shear
 Strength of a Rock Sample**

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 CMI Job # 17030701XRDB&C
 Date Reported: 5/10/2017

Sample Submitted to CMI Labs on: 3/7/2017
 Attention: Eric Wingate, Jared Vige

Sample ID												
		Grain Density (grams per cc)	Hayatdavoudi's Hydration Index (HHI)	Free energy of Hydration (Kcal/Mol)	Porosity (%)	Resistance to Maximum Compressive Stress at Failure (PSI)	Shearing Resistance to Failure (PSI)	Intrinsic Cohesive Srtength (PSI)				
		2.7	0.1668	98	17	95	47.5	33.0				
Deep Water Dredging Sample	12021											

Microscopic Description of the Rock Fragments after Compressional Failure: The general description of this rock can be calcareous, feldspatic shale / mudstone / clayey siltstone. The rock contains silt-sized 39% quartz and 23% feldspars with 21% clay. The 14% calcite in this rock occurs as cementing lime and also a few, small clam shells.

ND = Not Detected

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CMI # 17030701EDXXRD

Date Reported: 3/24/2017

Sample Submitted to CMI Labs on: 3/7/2017

Attention: Eric Wingate, Jared Vige

Sample ID	Semi Quantitative Weight Percent Elemental Composition by EDX Normalized to 100%																		Mineral Phases Identified by XRD									
	Carbon (C)	Oxygen (O)	Sodium (Na)	Magnesium (Mg)	Aluminum (Al)	Silicon (Si)	Phosphorus (P)	Sulfur (S)	Chlorine (Cl)	Potassium (K)	Calcium (Ca)	Chromium (Cr)	Manganese (Mn)	Iron (Fe)	Titanium (Ti)	Strontium (Sr)	Barium (Ba)	Copper (Cu)	Total	Quartz (SiO ₂)	K-Feldspars (KAlSi ₃ O ₈)	Plagioclase (NaAlSi ₃ O ₈)	Calcite (CaCO ₃)	Halite (NaCl)	Hematite(Fe ₂ O ₃)	Total Clay Minerals	Total Amorphous, Non-Diffractive Solids	Total
	1.29	43.37	0.85	1.51	8.36	28.44	ND	0.14	0.51	2.16	8.94	ND	ND	3.83	0.59	ND	ND	ND	100	39	16	7	14	<1	2	21	<1	100
Deep Water Dredging Sample	12021																											

DATA INTERPRETATIONS: Based on the EDX-XRD data above and microscopic examination of the as-received sample, the following observations are made: The lithology of the submitted rock material, as pictured above, can be described as calcareous (14% calcite), feldspatic shale. The tan / orange color of the shale is most probably due to the 2% iron oxide (hematite) content. The sample is probably coming from an area on the sea floor with a very low rate of sedimentation, where a calcareous, hard ground can be formed.

ND = None Detected

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