



File: Erionite/Beneficial Use

February 17, 2017

Michael Marler  
M&W Oilfield Supply  
7308 Hellen Drive  
Black Hawk, SD 57718

Dear Mr. Marler:

Re: Zeolite for oilfield waste stabilization

This letter is in response to your request for approval to use Zeolite for oilfield waste stabilization activities such as solidification of drill cuttings and as a drying agent for flowback water. The proposed Zeolite material is from the Sheaville Deposit in eastern Oregon and is mined and marketed by Ida-Ore Mining LLC. The North Dakota Department of Health's (Department) concern was that many Zeolite deposits in the western United States contain a mineral called Erionite, which is a known carcinogen linked with a significantly increased risk of mesothelioma. Laboratory analysis of the Zeolite sample from Ida-Ore Mining LLC shows that no Erionite was detected, using both x-ray diffraction and scanning electron microscopy.

The Department has no objection to using Zeolite material mined by Ida-Ore Mining LLC from the Sheaville Deposit for oilfield waste management activities. However, by statute, the Department only has authority to "approve" use of waste materials for beneficial use as a substitute for other commercial materials or products. The Zeolite material from Ida-Ore Mining LLC is a commercial product, not a waste, and as such the Department cannot "approve" its use.

As you know, our Department does not oversee the location, operation or reclamation of the oilfield waste drilling sites; these activities are under the direct oversight of the North Dakota Oil and Gas Division. We did not review any engineering information to document the waste stabilization properties of the Zeolite material. This review is only for health and environmental issues related to concerns for Erionite content and is not a determination on the effectiveness of this particular material for waste stabilization. This review is based on the information presented and our knowledge of the issues at that time. This review does not constitute an endorsement of the material and the name of the North Dakota Department of Health and its employees shall not be used in any advertisement or endorsement without the Department's written consent. If the

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source of Zeolite should change in the future, the new material must be analyzed for Erionite content by a qualified laboratory.

Should you have any comments or questions regarding this matter, please contact us at 701-328-5166.

Sincerely,



Scott A. Radig, P.E., Director  
Division of Waste Management

SAR:ljf

cc: Cody Vanderbusch, North Dakota Oil and Gas Division  
Ed Murphy, North Dakota Geological Survey  
Matt Lott, Ida-Ore Mining LLC

October 23, 2015

Lab no. 215466

Report reformatted according to client request February 7, 2017

Report reformatted February 8, 2017 asking for specific mention of erionite

Mr. Ryan Recla  
Ida-Ore Mining, LLC  
914 S. McDermott Rd  
Nampa, Idaho 83687

Dear Mr. Recla:

Enclosed are the x-ray fluorescence (XRF) and x-ray diffraction (XRD) results for eight Zeolite samples received last week. This report will be mailed and emailed to you.

The samples were crushed to -1/4" size before grinding and analysis. A representative split of each crushed sample was ground to approximately -400 mesh in a steel swing mill and then analyzed by our standard XRF procedure for 31 major, minor and trace elements. The relative precision/accuracy for this procedure is ~5–10% for major–minor elements and ~10–15% for trace elements (those elements listed in ppm) at levels greater than twice the detection limit in samples of average geologic composition. A replicate sample and a standard reference material ("GSP-2", a USGS standard rock) were analyzed with the samples to demonstrate analytical reproducibility for your samples and analytical accuracy for a geologic standard, respectively. The accepted ("known") values for the quality control standard are listed with the XRF results.

A portion of each ground sample was packed into a well-type plastic holder ("bulk mount") and then scanned with the diffractometer over the range,  $3-61^{\circ}2\theta$  using Cu-K $\alpha$  radiation. All the samples except "ZP-101" and "ZP-106" were also prepared as "oriented mounts" by mixing each ground sample with distilled water, drawing the mixture onto a filter and rolling the deposited material onto a glass disk. Each oriented mount was scanned over the range,  $2-30^{\circ}2\theta$ , treated with glycol and re-scanned over the range,  $2-22^{\circ}2\theta$ . Analysis of oriented mounts aids in the identification of clay minerals. The results of the scans are summarized as approximate mineral weight percent concentrations on the enclosed tables labeled, "XRD Results" and "XRD Results for Sample ZP-103." Estimates of mineral concentrations were made using our XRF-determined elemental compositions, the relative peak heights/areas on the bulk XRD scans and comparison to XRD data for zeolite standards. These samples appear to contain "amorphous" (noncrystalline) material. Amorphous material appears only as a broad elevation in the background of the XRD scan so its composition cannot be determined and the estimate of its concentration must be considered an educated guess based on the difference between the total mineral concentration and 100%. The detection limit for an average mineral in these samples is ~1-3% and the analytical reproducibility is approximately equal to the square root of the amount. "Unidentified" accounts for that portion of the scan which could not be resolved and a "?" indicates doubt in both mineral identification and amount. **The mineral, erionite was not detected in these samples.**

Thank you for the opportunity to be of service to Ida-Ore Mining.

Sincerely,

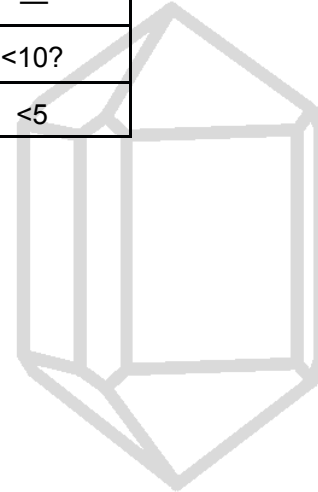
Peggy Dalheim

Mineral Name	Chemical Formula	Approx. Wt %
Clinoptilolite	$(\text{Na,K,Ca})_6(\text{Si,Al})_{36}\text{O}_{72}\cdot 20\text{H}_2\text{O}$	82
Smectite	$(\text{Ca,Na})_x(\text{Al,Mg,Fe})_4(\text{Si,Al})_8\text{O}_{20}(\text{OH,F})_4\cdot n\text{H}_2\text{O}$	<10
Quartz	$\text{SiO}_2$	—
Cristobalite/Opal	$\text{SiO}_2$	—
Plagioclase feldspar	$(\text{Na,Ca})\text{Al}(\text{Si,Al})_3\text{O}_8$	—
"Amorphous"	?	<10?
"Unidentified"	?	<5

Initial \_\_\_\_\_

Date \_\_\_\_\_

Analysis performed by The Mineral Lab, Inc



Lab