4-2016

# Iron Mobility in Desert Sandstone Aquifers: The Possible Role of Siderite

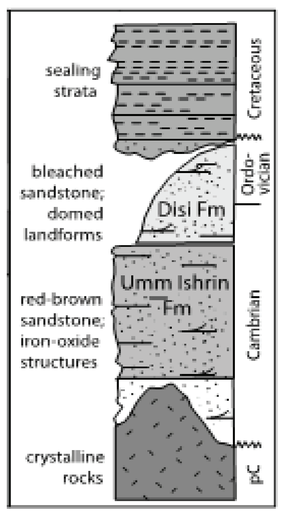
Lubna Al Azri
*University of Nebraska-Lincoln*, omna94@gmail.com

David Loope
*University of Nebraska - Lincoln*, dloope1@unl.edu

# Iron Mobility in Desert Sandstone Aquifers: The Possible Role of Siderite

Lubna Al- Azri, David Loope
University of Nebraska- Lincoln
UCARE

## Background

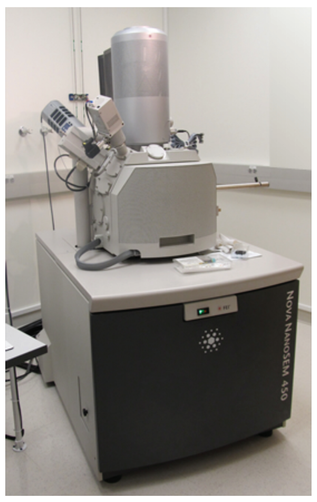

Jordanians and a large number of refugees are drinking radium-contaminated water from a sandstone aquifer. The problem is that this water passed through sandstone of the **Disi Formation** only after carbon dioxide and methane had bleached the sandstone, dissolving the **Iron-oxide coatings and liberating heavy metals and radionuclides** . The Iron that once coated the grains migrated to form Iron bands in the lower **Um Ishrin Formation**.

## Purpose and Hypothesis

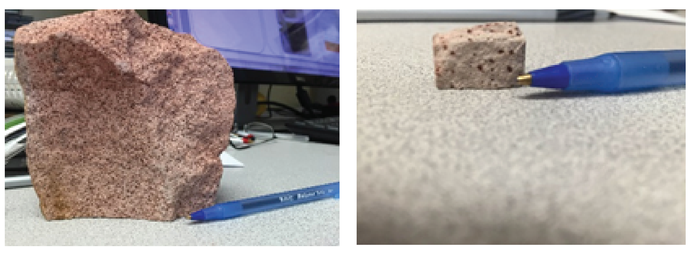
The major practical significance of this study involves **water quality**. The movement of Iron sandstone aquifers can drastically change groundwater chemistry; understanding how and when this movement takes place will help in locating safe supplies of drinking water.

**Hypothesis**: The rhombic, Iron-rich structures in the Jordanian sandstones are the altered remains of now-dissolved siderite crystals. It is important to figure out the elemental composition of the possible pseudomorphs, and to get a better look at their form.

## Materials and Methods



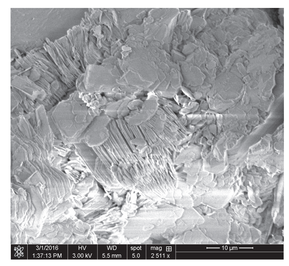

Scanning Electron Microscope (SEM)- Nanoscience facilities at Jorgensen Hall



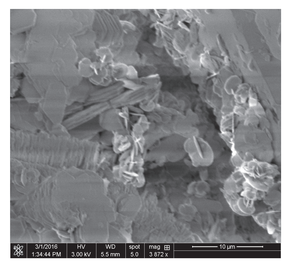
Sandstones from Um Ishrin Formation- Jordan

## Results

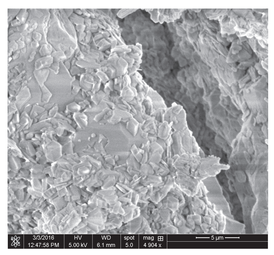
### Qualitative Data



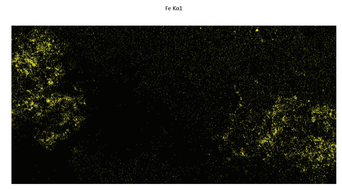
Kaolinite Books ($Al_2Si_2O_5(OH)_4$ ) replacing Feldspars.
Scale: 10 micro meters



Haematite ($Fe_2O_3$) cement between grains.
Scale: 10 micro meters

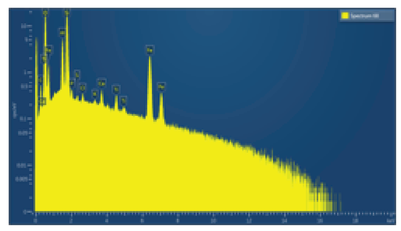


Quartz ($SiO_2$ ) overgrowth on sand grains.
Scale: 5 micro meters




Elemental mapping of Iron

### Quantitative Data



Mass Spectra

| Spectrum Label | Weight % |
|---|---|
| C | 4.26 |
| O | 30.47 |
| Al | 3.33 |
| Si | 16.23 |
| P | 0.16 |
| S | 0.07 |
| Cl | 0.12 |
| K | 0.06 |
| Ca | 0.28 |
| Ti | 0.36 |
| Fe | 9.23 |
| Total | 64.58 |

## Conclusion

- **Feldspar altered to Kaolinite books.**
- **Distribution of Iron in rhombic zones is consistent with siderite origin**

## Acknowledgements and Bibliography

I would like to express my deep gratitude to Dr. Richard Kettler for his guidance and help throughout this research. I would also like to thank Xingzhong Li 'Jim' for his help in offering me the resources and training in using the SEM and AZtech program.

- J.B Blanche, J.H Mc D. Whitaker, 1978, Diagenesis of part of the Brent Sand Formation (Middle Jurassic) of the northern North Sea Basin: geol. Soc. Lond., v.135, p. 73-82
- N.C Rossel, 1982, Clay Mineral Diagenesis in Rotleigend Aeolian Sandstones of the Southern North Sea: Clay minerals, v.17, p. 69-77