Direct Synthesis of Na-Autunite

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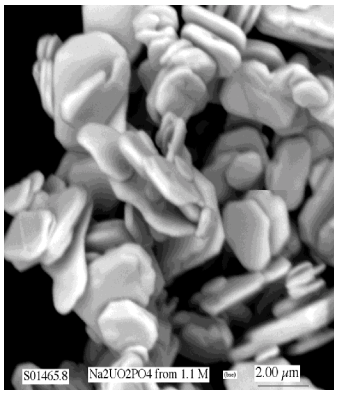
Rationale for This Study

Autunite $\{(X^{1-2+})_{2-1}(UO_2)_2(PO_4)_2(H_2O)_{10-12}\}$ saturation limits the mobility of UO_2^{2+} in natural and anthropogenically altered settings. However, methods for synthesizing autunite are indirect (1, 2) and frustrate efforts to obtain key stability data pertinent to understanding the migration of uranyl in the subsurface. We report progress on developing new methods for direct autunite synthesis.



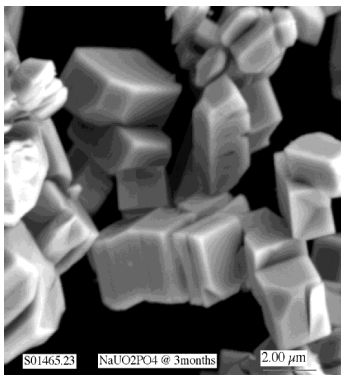


Figure 1: Synthetic Na-autunite

Discussion of Results

Mixing sodium phosphate dibasic and uranyl acetate at 70ºC resulted in direct, rapid precipitation of crystals. Examination by SEM (Figure) indicates that the morphology of the crystals is consistent with autunite, but also reveals distinct differences in the quality and structural stability of the products. Results of XRD and EDS analyses accord with either sodium autunite or meta-autunite. Other methods, such as growth from silica gels, also appear to be promising.

Conclusions

The preliminary results of our study indicate a solid prospect for direct synthesis of autunite-group minerals. These findings step toward a basis for unravelling the stability of uranyl-sequestering phases.

References

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Occurrence of Selenium in the Kerogen-Evidences of TEM

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The Laerma Se-Au deposit and Yutangba Se deposit are two important deposits found recently in China. Studies have shown that Se is closely related to the kerogen, and about 75% selenium is enriched in the kerogen in the Laerma Se-Au deposit and about 65.8% selenium enriched in the kerogen in the Yutangba selenium deposit.

Experiment and results

By the study of the Transmission Electron Microscope (TEM), the fact is presented that the occurrence of Se in the kerogen is completely different.

A lot of native selenium has been identified in samples of kerogen from the Yutangba selenium deposit. The native selenium is adhered or wrapped in the sandwich, cranny or pore space of the kerogen, usually presented with the amorphous shape.

There is not native selenium found in the kerogen from samples of the Laerma Se-Au deposit. The observation of TEM and analysis of EDS show selenium may be organic-bonded and probably form covalent bonds with oxygen-bearing radicals or combines with organism by substituting for sulfur.

We will provide only minimum of information in this paper. The typical spectrograms of EDS (Energy Dispersive Spectrometer) are shown in the figure below.

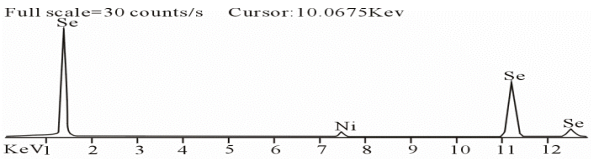

Figure 1 The EDS spectrogram of native selenium in the kerogen from the Yutangba Se deposit

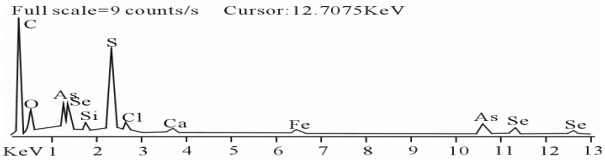

Figure 2 The EDS spectrogram of the kerogen from the Laerma Se-Au deposit, with selenium

Discussion and Conclusions

There are two direct factors for notion about the difference of occurrence of Se: Sulfur content in the kerogen and the condition of redox. Substitution of Se for S in Organic Matter is main way to form a species like $R\text{-}S_xSe_{1-x}$ in the Laerma deposit, whereas redox is very important to form native selenium in the Yutangba deposit.

References

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