



# Memorandum

**To:** Larry Connell  
**CC:**  
**From:** Terry Pepper  
**Date:** March 19, 1999  
**Re:** **ROYAL OAK ARSENIC - Arsenic Solubility**

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You will remember the last time I was in Seattle, I was trying to figure out why arsenic solubility in ferric arsenate was a function of crystal size. I talked to several people who has worked with stabilization for several years and got no reasonable answer.

I was reading a paper that Sue Lendrum had sent me a few weeks ago, when a possible chemistry fell into place. The clue was that R.G. Robbins had determined some years ago that ferric arsenate actually is not formed. The idea is the following:

1. The iron precipitates.
2. The arsenic adsorbs onto the iron precipitate.
3. If precipitation conditions are correct, large particles are formed, encapsulating arsenic.
4. If precipitation conditions are wrong, fine particles, with large surface area, are formed.
5. When the "ferric arsenate" materials are exposed to water, the amount of arsenic which goes into solution is not a function of solubility, but of the distribution constant between water and the surface of the iron precipitate.
6. Given the same distribution constant, higher surface area equals higher solution levels.
7. The arsenic encapsulated in large particles have no impact on the solution.

I haven't taken the time to chase this, but at least it has stopped the itch for the moment. I bet if someone were to measure particle surface area vs As solubility for ferric arsenates we would see a smooth curve.