



US VANADIUM

Michael R. Woolery

- Chemical Engineer – Rensselaer Polytechnic Institute
- 45 years experience in plant and process design
- Vanadium Technologist
- Familiar with vanadium processes worldwide
- Been to most of the currently active plants

U.S. Vanadium Industry

- ❖ Currently no active mining for vanadium in the U.S.
- ❖ Processing slags, power plant ashes, spent catalysts, etc.
- ❖ Items the IRIS documents claim to be main sources of anthropogenic release of vanadium to the environment
- ❖ Only two production facilities in the U.S.
- ❖ 95 % of worldwide vanadium production end up in either titanium or steel which will not release Vanadium to the environment

Sodium orthovanadate is not a relevant compound

- Exists in solution only at a pH above 12.5
- Contains 6 moles of NaOH per mole of V_2O_5
- Does not naturally occur in nature
- Is not formed in commercial vanadium processes
- Na addition to roast insufficient to form sodium orthovanadate
- pH of leach liquors shows that sodium pyrovanadate is formed

Toxicokinetic Properties Organic vs Inorganic V Compounds

- ❖ Vanadyl sulfate vs vanadyl oxalate
- ❖ Both are used to make the same products
- ❖ Similar solubility, pH and even color
- ❖ Produce same vanadyl ion under similar conditions
- ❖ Likely to have similar toxicokinetic properties

Vanadium and Organics

- Primary source of environmental exposure to vanadium is from food.
- Almost all vanadium in water is from natural sources.
- Volcanic sources are a prime origin
- Many of the North American vanadium deposits are organic in nature
 - ❖ Athabasca tar sands
 - ❖ Carnotite ores in Wyoming, Colorado and New Mexico
 - ❖ Asphaltenes
- Vanadium is present in crude oil...especially in Texas and California

Impact of RfD on the Vanadium Industry

- ❖ Current PPRTV of 7×10^{-5} mg/kg-day is below the background vanadium levels in water (tap water is 1.3 to 33 $\mu\text{g V/l}$)
- ❖ Ground water contamination – ground water vanadium levels in ore bodies are much higher than background...whether mined or not
- ❖ Effluent limits – water in the area of vanadium deposits is already above the national background levels
- ❖ Storm water permitting – storm water picks up soil which puts it above background for vanadium...everywhere
- ❖ Reclamation – even if ground water is reclaimed to background levels, it will increase over time due to higher vanadium in the soil