

Chemical Information Call-in Candidate: Nano Zero Valent Iron

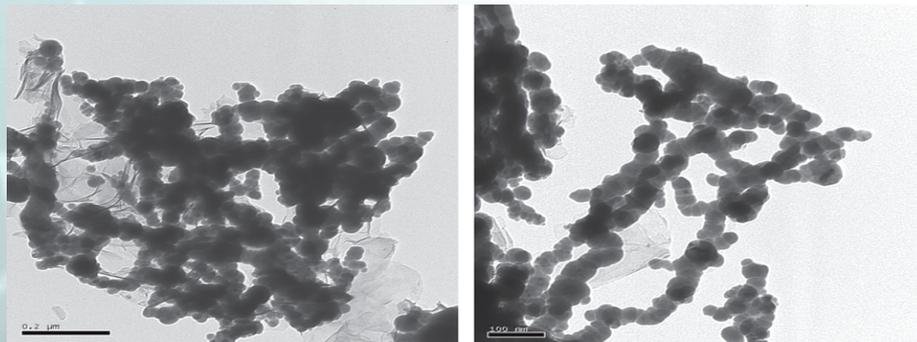
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OVERVIEW:

Nano Zero Valent Iron

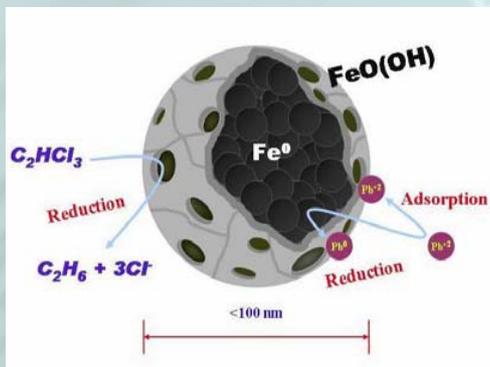
- **Why?**
 - **Growing NZVI Applications**
 - **Health and Environmental Concerns**
- **What Information Gaps?**
 - **Production, Products, and Applications**
 - **Toxicity and Environmental Fate**
 - **Analytical Methods**
- **Who?**
 - **Producers**
 - **Importers**
 - **Researchers**



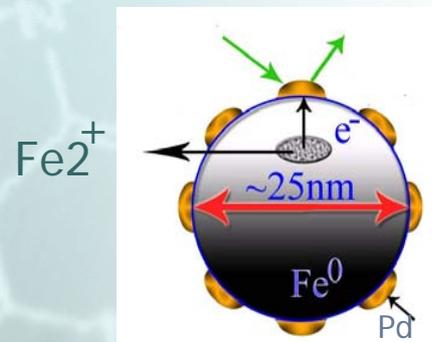
Transmission electron microscope (TEM) images of iron nanoparticles (Zhang, 2006b). Note: The scale bars in the figure are 200 nm

Applications: Remediation

- Nano and micro scale ZVI particles, powder or slurry; bimetallic (Fe/Pd) particles: Increasing trends of use for environmental remediation (groundwater and soil, etc.).



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Reaction of iron in a bimetallic nanoscale particle with TCE
(image courtesy of Wei-Xian Zhang, Lehigh University)

Other NZVI Applications

Nano iron as powder:

- **Magnetic materials** (coatings, sensors, memory and storage),
- **Electrodes** (batteries, fuel cells, water electrolysis, capacitors, integrated circuits), and
- **Chemical catalysts, etc..**

Nano iron as aqueous dispersion:

- **Adsorption of bio-molecules** for labeled probe synthesis
- **Drug carriers, Catalyst, Ferro-fluids**
- **Molecular delivery and heating**
- **High density magnetic recording, and Magnetic pastes etc..**

NZVI Vendors in California

- **American Elements (20-40 nm)**
- **AMEC Geomatrix (1-100 nm)**
- **Hepure Technologies (micron)**
- **OnMaterials (200 nm)**
- **Quantum Sphere (10-40 nm)**
- **Stanford Materials (25-40 nm)**
- **Sun Innovations (2-60 nm)**
- **Others?**

Human Health and Environmental Concerns

Researchers, USNIST and USEPA have expressed concerns in fate, transport in environment, toxicity of NZVI, and effects on ecosystem and human health.

NZVI Information Gaps

- **Information gaps: products, production, value chains, applications, analytical methods, toxicity, fate and transport, and stability of nano and micro scale ZVI as used, throughout ZVI life cycle, etc.**
- **California DTSC and USEPA are partnering to share information and promote safe use.**

Questions for Producers, Importers, Researchers, and Others

What are the analytical methods for assessment of toxic effects and safe uses of nano zero valent iron across its lifecycle?

- **How do you sample, measure, and monitor quality? Performance?**
- **How do you detect, measure, and monitor releases from facility operations?**
- **How do you measure and monitor fate and transport after useful life?**

