

Preparing substrates using sol-gel techniques

Principle

Dissolving a ferrous iron salt in an oxygen-free carbonate buffered solution results in sol formation. After adding additional substances to be incorporated in the final precipitate, the mixture is oxidized by purging it with pressured air. First a gel is formed by the agglomeration of the sol and by loss of crystal water and oxidation; the final solid precipitates. The resulting precipitate can be allowed to settle onto silicate particles or cover slides. After decanting the supernatant solution and washing, the solid phase is dried over blue gel in a vacuum.

Experimental

Prepare a solution by adding first potassium dihydrogen phosphate (KH_2PO_4) or disodium hydrogen arsenate ($\text{Na}_2\text{HAsO}_4 \cdot 7\text{H}_2\text{O}$) and then ferrous iron sulfate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) to a carbon buffered solution (pH 6.9) eventually containing other ions.

Purge compressed air for 12 hours through the solution starting at a temperature of 277 K.

During the precipitation procedure the appearance of the solution becomes first milky then light yellow or orange-brown depending on the content of phosphate or arsenate.

The precipitates are centrifuged, washed with demineralized water and dried over blue gel in a vacuum.

For determining the amount of incorporated phosphate and arsenate, take samples of the supernatant solution after addition of phosphate or arsenate and after completion of the precipitation, respectively.

Phosphate can be analysed by ion-chromatography and arsenate by colorimetry. The difference in the analysis results is the amount of incorporated anions.

Literatur

- Driehaus, W., M. Meikel and U. Hildebrand. 1994. Granular ferric hydroxide - a new adsorbent for the removal of arsenic from natural water. *J. Water Sci. Technol. – Aqua* 47:30-35
- M. Wagner 1999. Phosphorus Scavenging and Microbially Mediated Phosphate Release from Iron Particles. PhD thesis, University of Zürich, 57-59