Pyrite (FeS_2) oxidation at pH<3

DESCOSTES, M.[1], VITORGE P.[1,2], MERCIER, F.[2] AND BEAUCAIRE, C.[3]

[1]CEA/DEN/DPC/SCPA/LCRE, CEN Saclay, F-91191 Gif-sur-Yvette (michael.descostes@cea.fr)
[2]CNRS-UMR 8587, CEN Saclay, F-91191 Gif-sur-Yvette
[3]IRSN/DPRE/SERGD, F-92265 Fontenay-aux-Roses

FeS_2 oxidative dissolution in acidic media has been studied using quite every analysis technique available to scientist. We propose to use the $R=[S]_{total}/[Fe]_{total}$ aqueous ratio measured in batch dissolution experiments at pH≅2 in addition to solid characterization methods to identify the reactional mechanism. A value of R=2 is expected if the dissolution is thought to be stoichiometric. Aqueous S and Fe are respectively under SO_4^{2-} and Fe^{2+} forms. However a S deficit in solution was observed, leading to a ratio close to R=1.60. This S deficit was confirmed by complementary studies (Cf. fig. 1 and Descostes, 2001 for references and experimental procedures). We propose a mechanism based on S aqueous chemistry. $S_2O_3^{2-}$ is the first sulfoxyanion released in solution (Descostes *et al.*, 2001 and 2002). It is not stable in acidic medium (Cf. fig.2), and disproportionates into S^0 and $S_4O_6^{2-}$ before complete and rapid oxidation into SO_4^{2-} leading to $R=2n/n'$ where n and n' are the oxidation numbers of S in $S_2O_3^{2-}$ and $S_4O_6^{2-}$ respectively.

Figure 1: S/Fe ratio plotted against pH.

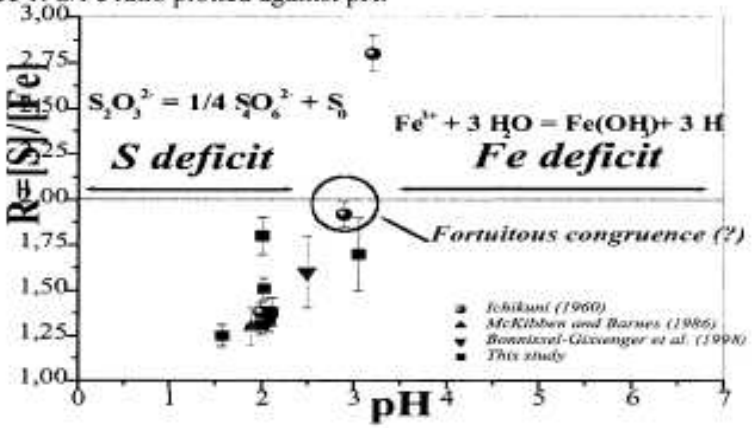
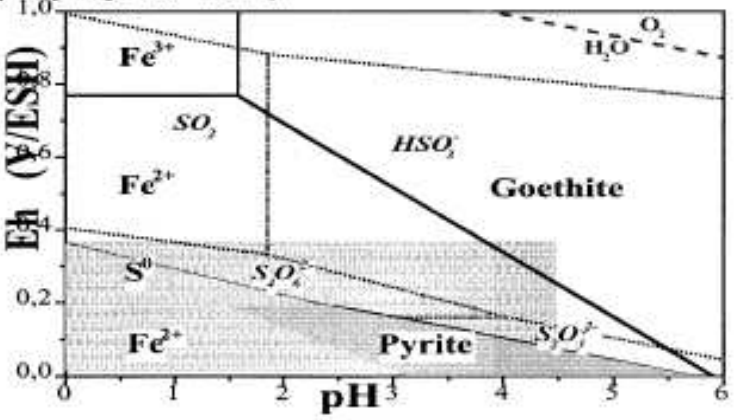


Figure 2: Fe Pourbaix diagram including S metastable species ($[\Sigma S]=2\times[\Sigma Fe]=2.10^{-3}$ mol/L).



References

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