

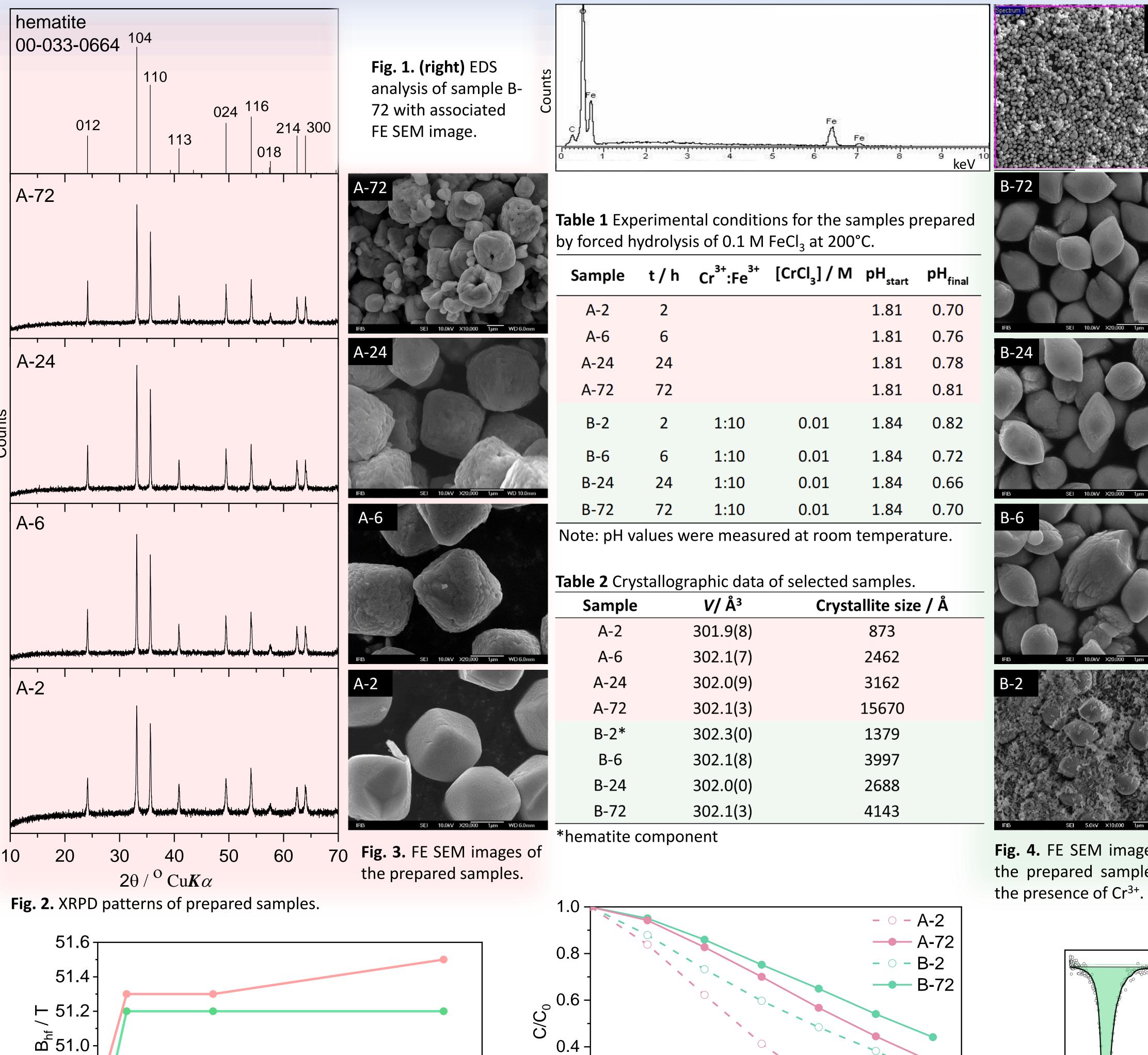
FORCED HYDROLYSIS OF FeCl₃ SOLUTIONS IN THE PRESENCE OF Cr³⁺ IONS IN ACIDIC MEDIUM

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Introduction

Precipitation chemistry of iron oxides (group name for Fe-hydroxides, -oxyhydroxides) has been the subject of numerous investigations over the last several decades. In the present work we report new results about the formation of β -FeOOH and transformation into α -Fe₂O₃ by the forced hydrolysis of FeCl₃ solutions in the presence of Cr³⁺. This systematic investigation was undertaken in order to better understand the nature of physico-chemical effects of the solid phase formed by the forced hydrolyses of FeCl₃ in the presence of transition metal cations at pH<2. Although there are many publications that examined the impact of various metal cations on the forced hydrolysis of FeCl₃ solutions, there are still uncertainties about the role of metal cations in these processes. Forced hydrolyses of FeCl₃ solutions in the presence of Cr3+ ions without alkali addition were investigated at 200°C. These precipitation systems were compared to corresponding reference systems. The isolated precipitates were characterized with XRD, ⁵⁷Fe Mössbauer, FT-IR, FE SEM and photocatalytic measurements. Since no specific adsorption of Cr³⁺ ions occurred in the acidic pH medium [1], it was inferred that traces of Cr³⁺ ions enter into the structural tunnels of β -FeOOH crystals. It can be assumed that α -Fe₂O₃ crystals start to grow on very fine and thin β -FeOOH crystallites [2] which were not completely dissolved, but were previously affected by Cr³⁺ ions.



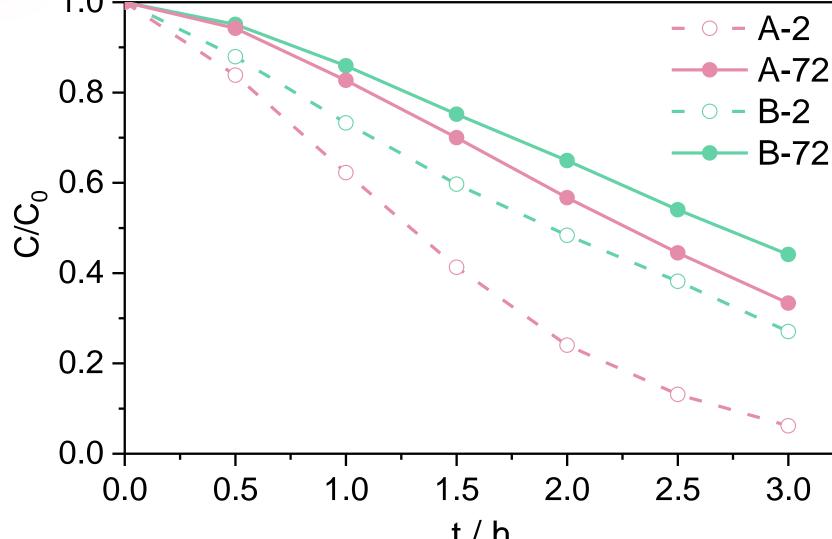


Fig. 7. Photocatalytic effects of reference samples A-2 and A-72 relative to samples B-2 and B-72.

Conclusions

50.8

50.6

Although there is no chromium found in prepared samples, the presence of Cr³⁺ in hydrolysing solutions shown several effects:

- Relative intensities of diffraction lines 104 and 110 in the XRD patterns are changed
- Phase transformation of β -FeOOH to α -Fe₂O₃ is impeded due to presence of Cr³⁺ influence on the phase composition
- Gradual crystallinity decrease is observed within kinetics experiments

Fig. 6. B_{hf} values of the hematite phase in samples B-2 to B-72

showing a decrease in relation to reference samples A-2 to A-72.

- Lower B_{hf} values are observed for samples synthesized in presence of Cr³⁺
- Cr^{3+} showed a significant impact on the shape of α -Fe₂O₃ particles-lemon-like particles instead of cube-like particles
- Different behaviour in photocatalysis

Acknowledgement

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Samples A-2 to A-72

Samples B-2 to B-72

60

00-033-0664 018 B-72 B-24 B-6 B-2 Fig. 4. FE SEM images of 10 2θ / O Cu $K\alpha$ the prepared samples in

hematite

in the presence of Cr³⁺.

Fig. 5. XRPD patterns of prepared samples

Velocity / mms⁻¹ Fig. 8. Mössbauer spectrum of sample B-2 recorded at RT.

B-2

References

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[1] S. Musić, J. Radioanal. Nucl. Chem. Artic. 1986, 100, 185.

[2] J.-P. Jolivet, M. Henry, J. Livage, Metal oxide chemistry and synthesis. From solution to solid state, John Wiley & Sons, Ltd., Paris, 1994, pp. 165-168.