



## O26. Exploring the Ti influence on the electrochemical reduction of iron from iron oxide based ceramics

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The electrochemical reduction of iron oxides to iron in alkaline media represents a CO<sub>2</sub>-lean novel approach for iron making compared to the conventional carbothermal reduction process [1]. Iron oxides ores are frequently used as feedstock materials due to their abundance and low cost. Iron-bearing minerals, such as pseudobrookite (Fe<sub>2</sub>TiO<sub>5</sub>) are an interesting feedstock for this purpose. The present work explores the Ti-effect during the electroreduction to Fe imposed by highly-porous Fe<sub>2</sub>TiO<sub>5</sub> ceramics as an alternative raw material. Hematite and Fe<sub>2</sub>O<sub>3</sub>.Fe<sub>2</sub>TiO<sub>5</sub> composite cathodes were prepared for the sake of comparison. All highly-porous cathodes were processed based on powder water suspensions followed by emulsification with liquid paraffin, as described in [2]. The electrochemical tests were performed in alkaline conditions (NaOH, 10 M) at 80 °C, with a Pt wire as a counter electrode and a reference electrode of Hg|HgO|NaOH (1 M). A PGSTAT302N potentiostat was used for chronoamperometry (-1.30 to -1.15 V, 7 h) and cyclic-voltammetry (-1.2 to 0 V, 10 mV/s) studies. Combined XRD/SEM/EDS studies revealed the Fe formation only at -1.30 V, indicating a compromise of the current efficiency due to strong hydrogen evolution. Despite the presence of Ti as a non-conductive phase imposed complex effects during the electroreduction, one can still take into consideration the obtained material for catalysis applications and/or consider the iron enrichment of Ti-containing iron oxide ores for further electroreduction.

### References

- [1] A. Allanore, H. Lavelaine, G. Valentin, J.P. Birat and F. Lapique, *J. Electrochem. Soc.*, **155**, E125–E129 (2008).
- [2] D.V. Lopes, A.V. Kovalevsky, M.J. Quina and J.R. Frade, *Ceram. Int.*, **44**, 20354-20360 (2018).