

## Mantle-drip magmatism beneath the Altiplano-Puna plateau, central Andes

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Convective removal of continental lithospheric roots has been postulated to be the primary mechanism of recycling lithospheric mass into the asthenosphere under large plateaux such as the Altiplano-Puna. Convective instabilities are especially likely to develop where there is extensive intermediate arc-like magmatism in the upper plate, as the residual masses complementing these magmatic products are typically denser than the underlying mantle. Mafic volcanic rocks erupted on the central Andean Altiplano-Puna plateau during the past 25 My contain evidence of this process. Here we use equilibration temperatures, age data and geochemical constraints—primarily based on transition metals—to show that the most important source materials by mass for this mantle-derived magmatism are pyroxenites from the lower parts of the lithosphere, with only minor contributions from mantle peridotite. Pyroxenites are denser than typical upper mantle whether they are garnet bearing or not, and are therefore likely to contribute to destabilizing parts of the continental lithosphere. The pattern of melting is consistent with the process of foundering/dripping of small-scale (<50 km diameter) density anomalies in the lithosphere, where mafic volcanic fields on the plateau represent the manifestations of individual drips.

## Reactivity and chemical reduction of iron oxides nanoparticles in highly alkaline medium

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Iron oxides play an important role in steel industry as precursors of iron. This industry is responsible for 7% of the world CO<sub>2</sub> rejections. Reducing the iron oxides by electrolysis in strongly alkaline medium (18 M) at 110°C is a promising way to lower the CO<sub>2</sub> rejections while improving steel production efficiency, that has been studied for years [1][2]. Obviously, studying the reactivity of iron oxides in this very particular medium and understanding the reduction mechanism is a key study for the process optimization. The experiments are carried out on iron oxides nanoparticles (hematite, goethite, lepidocrocite, akaganeite, magnetite) synthesized according to well known methods in order to have the most accurate comprehension of the phenomenon.

In almost all cases, the ageing of iron oxides nanoparticles in hot concentrated sodium hydroxide solution led to the formation of sodium ferrite NaFeO<sub>2</sub>, as it was observed by Picard [2]. This phase transformation takes place according to a dissolution crystallization process whose duration is controlled by thermodynamics and depends on the starting iron oxide.

In a second step, we induced the reduction by using hydrazine as a chemical reductive agent in hot concentrated sodium hydroxide solution. At first a competition between reduction of the iron oxide and sodium ferrite precipitation is observed. Then the reduction takes place according to a two-step via solution mechanism: reduction of the starting iron oxide into magnetite, reduction of magnetite into iron.

[1]Allanore (2008) *J. Electrochem. Soc* **155**, 125-129, [2] Picard (1980) *J. Chem. Res., Synop* **8**, 252-253