A Furnace for *in situ* Time Resolved Diffraction with Gas Flow

Olivier Leynaud[a], Dmitry Strusevich[a], Simon Jacques[a], Peter Hutchins[a] , Paul Barnes[a], Gopinathan Sankar[b], [a]*Industrial Materials Group, Birkbeck College, London, England.* [b]*Royal Institution, London, England.* E-mail: o.leynaud@cryst.bbk.ac.uk

The understanding of chemical reactions has become a major challenge in the development of new materials and processes, and the improvement of existing industrial processes. *In situ* time resolved diffraction is one obvious solution, and the use of synchrotron sources coupled with outstanding detectors such as RAPID2 [1] allows the collection of refinable patterns in times as short as 1s [2].

In order to observe the reactions in different non-ambient conditions, we designed a furnace able to perform classical temperature dependent experiments, but also allowing a gas to flow through the capillary. This unique design is highly interesting, especially for the study of reactions occurring in the presence of oxidative or reductive conditions (e.g. catalysis). The use of this device and of a synchrotron source was already proven and we were able to observe an oxidation occurring in less than 20s! [3].

The furnace designed for these experiments is slimmer than the length of the capillary, and can reach temperatures up to 950°C. A rotating seal is used for the gas insertion (alternatively it can be connected to a vacuum line). It is fixed on the goniometer allowing the spinning of the capillary. The gas is collected at the other side of the furnace and can be study with a gas analyzer.

[1] Berry A., Helsby W.I., et al., *Nucl. Instr. Meth. Phys. Res. A*, 2003, **513**, 260. [2] Cernik R.J., Barnes P., et al., *J. Synchrotron Rad.*, 2004, **11**, 163. [3] Jacques S., Leynaud O., et al., *in preparation*.

Keywords: *in situ* diffraction, time-resolved, red-ox reactions