X-ray Diffraction Computed Tomography – data collection strategy and application for operando studies of catalytic systems

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X-ray diffraction computed tomography is a technique that combines powder X-ray diffraction (PXRD) with computed tomography (CT). In contrast to standard computed tomography (CT), based on the difference in the attenuation of X-rays from the materials present in the sample, XRD-CT uses the difference in the diffraction signals from the crystalline materials present in the sample. Therefore, additional physico-chemical information is obtained. In the reconstructed image, each pixel corresponds to a complete diffraction patter, and thus different crystalline chemical species can be mapped inside the cross section of a bulk object [1].
XRD-CT technique is applied in synchrotrons (ID15 of ESRF), due to its remarkable properties (high flux, monochromatic beam, state-of-the-art detector, etc.) and was found to be a suitable technique for the *insitu* studies of heterogeneous catalysts, providing high temporal and spatial resolved data [2]. The ultimate goal of catalysis is to understand the relation between catalyst structure and its function in the studied reaction. For this purpose, it is important to observe the behaviour of the catalyst under *operando* conditions, collecting the information at different length scale over the entire volume of catalyst [3]. Recently, a new data collection strategy called interlaced XRD-CT was developed [4] in order to provide the post experiment choice between temporal and spatial resolution. Another data collection strategy, allowing us to image the whole catalyst bed (cross section by cross section) in a reasonable amount of time is being developed.
The purpose of this work is to demonstrate how the XRD-CT technique works together with the recent development of data collection strategy that is necessary for the *insitu* studies of materials. Different types of data that can be obtained with this technique are presented, with the example of catalyst for the OCM (oxidative coupling of methane) process.

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