MS40-1-5 Differential scanning diffraction and differential scanning imaging as novel methods for in situ studies of organic eutectic systems
#MS40-1-5

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Abstract
In the last decade, hot/cold stages have been made available to laboratories, which allowed scientist to carry out in situ X-ray diffraction experiments at non-environmental conditions [1], without having to rely on large-scale structures such as synchrotrons. This, combined with the increasingly improved detectors and data collection systems, allow to collect huge amounts of data in a few hours of experiments, also at lab facilities. With this new instrument configuration available, numerous in situ experiments were performed in non-ambient temperature conditions collecting simultaneous imaging and diffraction data, thus studying structural and morphology features in one shot [2]. The advantage of experiments in presence of temperature gradients lies in the possibility of observing step by step the transformations of the samples being analyzed along the entire transformation, being it a phase transition from one physical state to another, or formation of one polymorph into another or a chemical reaction. Exploiting in situ imaging and X-ray diffraction data, coupled to PCA multivariate analysis [3], we introduce two new techniques called differential scanning diffraction and differential scanning imaging respectively. These two techniques allow to obtain, in addition to the information related to the structure of the samples, information related to the transformations induced by temperature in a very similar way to those that can be obtained using differential scanning calorimetry. The technique has been applied in the study of different materials of interest, e.g. inorganic (as test case) and organic-based eutectic mixtures known as deep eutectic solvents (DES) .

References
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DSD profile of a DES eutectic mixture.