The Application of X-ray Scattering Contrast Imaging Methods for the Characterisation of Catalytic Nanomaterials

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X-ray diffraction/scattering computed tomography (XDS-CT) techniques have emerged as powerful non-destructive imaging methods capable of providing spatially resolved chemical information. In particular, the technique is well suited for the characterization of real materials and devices facilitating the translation of materials from the lab to the field. In this work we demonstrate how XDS-CT has been used to profile structured catalysts and catalytic reactors *in situ*, *quasi in situ* and under *operando* conditions in 3D, 4D and ultimately in 5D, clearly demonstrating how spatially resolved chemical imaging techniques are necessary to identify the nature and location of new phases that evolve with time on stream [1-4].

References [1] Farooq, D., et al. ACS Catal. 2024, 14, 12269-12281; [2] Matras, D. et al. J. Mat. Chem. A 2021, 9 (18), 11331-11346; [3] Bobitan, A. et al. *Manuscript in preparation*; [4] Dong, H. et al. ChemRxiv. 2025; doi:10.26434/chemrxiv-2025-m1v5v