Pore Structural Changes in a Technical Catalyst Under Sulfur Poisoning Revealed with Multiscale Imaging

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Pd/Al_2O_3 washcoated monoliths used for methane oxidation undergo deactivation due to sulfur poisoning, having a profound impact on their hierarchical porous structure.[1] One strategy to examine sulfur poisoning relies on 3D structural imaging addressing all length scales, encompassing both high spatial resolution for precise data, and over extensive fields of view to ensure representative data. In this study, we examined Pd/Al_2O_3 washcoated honeycomb catalysts in pristine and sulfur-poisoned states using four tomography techniques at varying length scales: (i) Electron Tomography (ET); (ii) Nanoscale X-ray Computed Tomography (nano-CT); (iii) X-ray Holotomography (HT); and (iv) Microscale X-ray Computed Tomography (µ-CT). All four imaging techniques demonstrated the ability to provide precise structural data, including surface area, volume fraction, and pore size distribution, with nanoscale spatial resolution.[2] Consequently, these diverse imaging techniques complement each other in their applications.

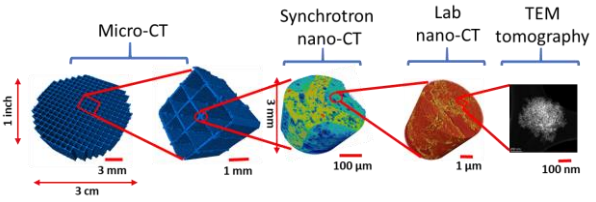

Figure 1: 2D and 3D volume renderings from all applied techniques.

[1] P. Lott *et al.*, *Appl. Catal. B*. 2020, **278**, 119244.
[2] Y. Fam *et al.*, *ChemCatChem* 2018, **10**, 2858.