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Chasing changing catalysts with XAFS and high energy X-ray techniques combined with infrared spectroscopy

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Starting from a synchronous combination of XAFS with Diffuse reflectance infrared spectroscopy (DRIFTS), a novel combination of very hard (86 keV) X-ray diffraction with DRIFTS will be outlined. The potential for combining these techniques for the in situ study of the dynamic structural-reactive behaviour of working catalysts with high ($\ll 1$ second) time resolution will be demonstrated using the examples of nanoparticulate Pd/Al₂O₃ and Pd/CeZrO₄/Al₂O₃ catalysts during CO/NO cycling. Further, recent results, obtained from 1 wt% Pt/Al₂O₃ catalysts during stoichiometric - lean CO/O₂ cycling, using a time resolved Pair distribution function (PDF) approach to analysis of hard (60 keV) X-ray scattering data will be presented and contrasted with time resolved XAFS measurements of the same systems. Lastly, the combination of total X-ray scattering/PDF techniques with DRIFTS, and the possibility of directly combining XAFS with total scattering approaches in one beamline, will also be discussed.

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