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Laser induced fluorescence applied to catalysis

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Motivated mainly by catalysis, gas-surface interaction between single crystal surfaces and molecules has been studied for decades. Most studies have been performed in well-controlled environments, and has been instrumental for the present day understanding of catalysis. We have for some years explored the possibilities to perform experiments at conditions closer to those of a technical catalyst, in particular at increased pressures. In this contribution we will show examples from catalytic CO oxidation over Pd single crystal surfaces using Ambient Pressure X-ray Photo emission Spectroscopy (APXPS) [1] and High Energy Surface X-Ray Diffraction (HESXRD) [2] at more realistic conditions. However, the detected surface structure during the reaction is sensitive to the composition of the gas phase close to the catalyst surface [3-4]. Therefore, the catalytic activity of the sample will itself affect the surface structure, which in turn may complicate the assignment of the active phase. For this reason, we have applied 2D Planar Laser Induced Fluorescence (PLIF) to the gas phase in the vicinity of an active model catalysts [5-7]. In particular, these measurements enables a direct view of the onset and location of the catalytic activity. Further, the gas phase distribution in more complicated reactors such as in the APXPS case may be explored, see Fig. 1.

References
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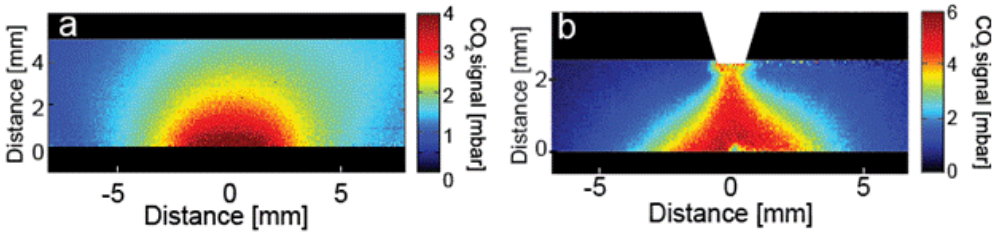
Figure 1 The 2D CO_2 gas phase distribution around an active model catalyst (6 mbar CO, 6 mbar O2, 138 mbar Ar, T=300°C) a) In a cubic reactor. b) In a cubic reactor with pumping from a cone simulating the nozzle of the electron analyzer in an APXPS set up.



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