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| ESRF | **Experiment title:**<br>Spatially resolved XAS studies to elucidate the activation and deactivation behaviour of monometallic Pd/$CeO_2$ and bimetallic Pd-Pt/$CeO_2$ catalysts for emission control | **Experiment number**:<br>CH-5742 |
| **Beamline**:<br>BM23 | **Date of experiment**:<br>from: 17/02/2021 to: 22/02/2021 | **Date of report**: |
| **Shifts:**<br>15 | **Local contact(s)**:<br>Kirill Lomachenko | *Received at ESRF:* |

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**Report:**

Efficient exhaust gas catalysts will decide about the future of internal combustion engines for stationary and mobile applications. A promising approach to improve ceria-based catalysts is to take advantage of the interfacial sites between the noble metal (NM) and support. By choosing the appropriate pre-treatment, it is possible to maintain a high dispersion of the noble metal by exploiting the strong noble metal-support interaction. The study was aimed at investigating the effect of different pretreatment procedures on the local structure of Pd and Pt in monometallic and bimetallic Pd-Pt/$CeO_2$ catalysts and correlating these variations to the catalytic behavior for CO oxidation. The tests were conducted in a capillary microreactor heated by a hot gas blower (Oxford). Reactive gases were dosed with mass flow-controllers, using the dedicated gas dosing unit available at BM23. The reacted gas mixture was monitored at the outlet using a mass spectrometer (Pfeiffer Vacuum) and a NDIR instrument (ABB). The 2% NM/$CeO_2$ catalysts were analysed under model CO oxidation reaction, to a maximal temperature of 300°C. Additionally, temperature programmed reduction experiments were conducted with CO or $H_2$ as reducing gas (e.g. Fig.1).

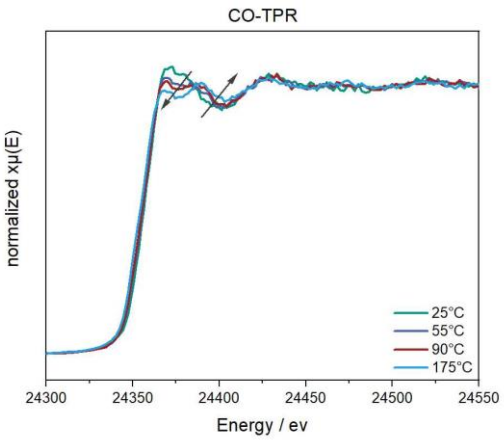


*Figure 1* Pd K-edge XANES spectra recorded during CO-Temperature Programmed Reduction on 2 % Pd/$CeO_2$ catalyst, recorded in fluorescence mode

Due to the travel and operational limitations (only 2 users per experiment) imposed by the Sars-CoV-2 pandemic, the planned experiments had to be significantly simplified (e.g., it was not possible to performed the planned thermography evaluations).

Preliminary results indicate a clear impact of the pre-treatment conditions on the catalytic and electronic behaviour of the noble metal species, in particular for the bimetallic catalysts. The obtained data is currently analysed in detail at KIT and will be included in future publications.