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Structure matters: asymmetric CO ignition at square and triangular Rh steps

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Tracking the active site of catalytic metallic nanoparticles in mandatory for tailoring new catalysts and promote a clean and green environment. The activity of each of the facets of the nanoparticle will differ depending on the orientation and coordination of surface atoms [1], yet isolating their individual activity is typically challenging. Within this context, curved crystals possess several dif-ferent planes, hence they are ideal for selectively probing different types of undercoordinated at-oms [2,3]. Using this methodology, we have studied the CO oxidation on Rh stepped surfaces using a curved Rh(111) crystal. This peculiar sample features the flat (111) surface at the center of the crystal, and an increasing density of either A- (square) and B- (triangular) steps as one approaches each of the edges of the sample.
Preliminary Planar Laser-Induce Fluorescence (PLIF) experiments reveal that the B-side of the crys-tal ignites earlier during the CO oxidation, mimicking the results obtained using an identical curved Pd(111) crystal [2b], and in clear contradiction with the symmetric ignition observed for a curved Pt(111) sample [3]. Near-ambient pressure X-ray photoemission measurements conducted on the same curved Rh(111) crystal show that prior to the ignition of the whole sample, which is marked by an abrupt CO desorption and CO2 production, the B-steps are partially CO-depleted and oxi-dized, while the A-steps feature a CO-saturated situation. Therefore, such large asymmetry in the chemical composition of A- and B-steps points to be the reason of the early ignition of the B-steps observed by PLIF.

References
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