High resolution anion photoelectron spectroscopy of the platinum trimer*

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Small transition metal clusters serve as models for catalytic systems of interest for science and technology. In particular the metals of the platinum group are widely used in heterogeneous catalysis for a range of economically and environmentally important processes. Nevertheless, the understanding of their structural and electronic properties is still limited [1].

Anion photoelectron spectroscopy (PES) probes the electronic structures of the clusters and when using high resolution variants even low-frequency vibrational structure, characteristic for the structure of the metal clusters, can be resolved.

Here we focus on the anionic platinum trimer. In earlier studies no conclusive assignment of the PES spectrum has been obtained.[2] High resolution anion photoelectron spectroscopy using velocity map imaging (VMI) allows to resolve a multitude of undetected earlier vibronic transitions giving, in combination with density functional theory calculations, Franck-Condon simulations and anisotropy parameter analysis, insights into the structures of the anionic and neutral states of this cluster. Features up to binding energies of 3.7 eV can be unequivocally assigned to transitions corresponding to the triangular (bands X-C) or linear (D-G) isomers of the platinum trimer

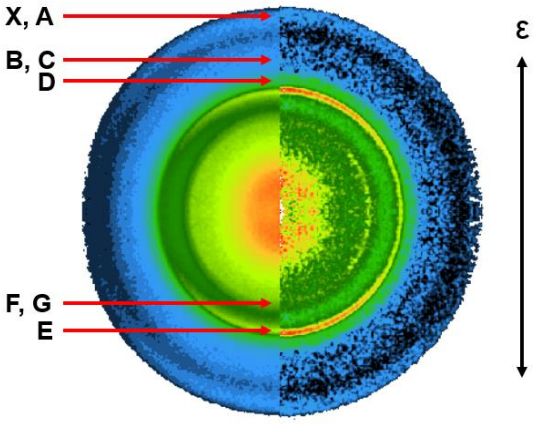

Figure 1: Left side: 2D Projection of the electron distribution obtained by VMI-PES at 300 nm (4.13 eV). Right side: Abel inverted image corresponding to a slice of the spatial electron distribution. Specific bands are marked by capital letters.

[1] D.J. Harding and A. Fielicke, Chem. Eur. J. 20, 3258 (2014)
[2] K.M.Ervin, J.Hoe and W.C. Lineberger, J. Chem. Phys. 89, 4514 (1988)

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