Study of TMDs flakes with ARPES at LOREA beamline of ALBA Synchrotron

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Abstract

Here we report of the study of VSe_2 few layers, as well as of other transition metal dichalcogenides (TMDs) transferred *in-situ* on Au at LOREA beamline of ALBA. LOREA is the Angle Resolved PhotoElectron Spectroscopy (ARPES) beamline at ALBA Synchrotron, which is characterised by high energy resolution and large energy range. Another important property of LOREA is the beam spot size on the sample, which is about 20µmx15µm (HxV) and allows to measure very small samples, including flakes. Small samples can be optically observed with a microscope pointing onto the sample in the same direction of the beam. However, for monolayer flakes, which are optically not active, a different strategy is followed. In this case, we use the possibility to scan the sample position in a reproducible way to detect either ARPES or core level features which are related to the monolayer. The resulting measurements are directly analysed using clustering and principal components analysis in order to detect regions with different flake thicknesses without an *a priori* knowledge of the sample morphology. The interesting regions are then characterised in full using the versatility of LOREA, for example the measurement of the Fermi surface, the spin polarization of electronic bands.

References

Tallarida, M., Oton, J., Raventós Tato, M., DAI, J., & Angela, Z. (2025). Au_Mica ARPES dataset measured at the LOREA beamline of the ALBA Synchrotron [Data set]. Zenodo. https://doi.org/10.5281/zenodo.14893727

Figures

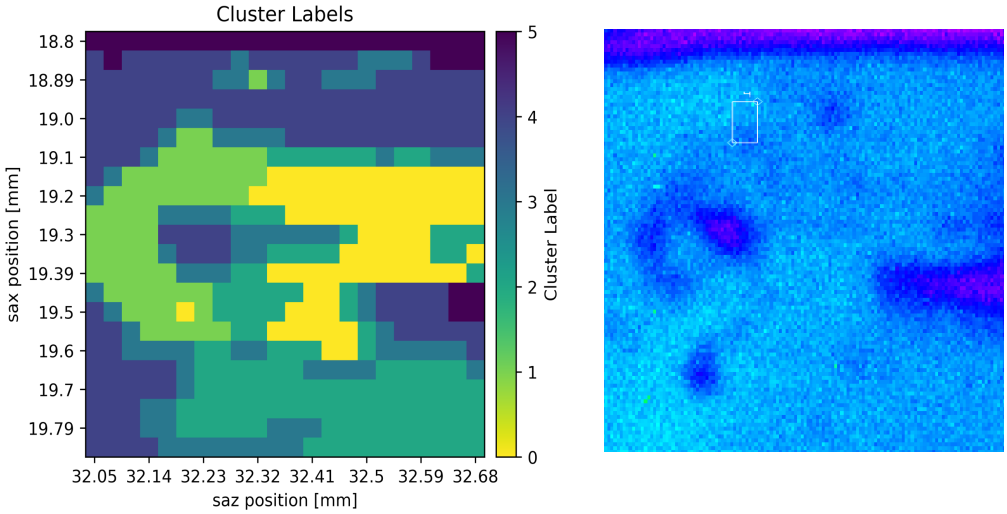

Figure 1: Comparison of the clustered map obtained from the core level measurement and the sample picture obtained with the optical microscopy. Different clusters correspond to flakes of different thickness or the sample substrate.