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Surfaces and buried interfaces characterization of Mn/ZnO and Cu₂ZnSnS₄ based device: lessons learned from lab to synchrotron facilities

A detailed picture of the thermally activated processes occurring at the Mn/ZnO interface was obtained by a combination of wide range of techniques. The low energy electron diffraction (LEED), the scanning tunnelling microscopy (STM) and spectroscopic techniques based on Auger electron (AES) and on high energy X-ray: X-ray photoelectron and absorption spectroscopies (HAXPES and XANES) and the kinematical X-ray standing wave method (KXSW) allow not only to investigate the chemistry at the heterojunction but also to describe in detail the thermal structure transformations and diffusion process.

We also highlighted the structural and electronic properties of ZnO/CdS/Cu₂ZnSnS₄/Mo interfaces in different photovoltaic cells by the combination of SEM and destructive XPS depth profiles. The observed composition changes play a key role in the cell performances. The results may also drive a better control of the interfaces in quaternary based photovoltaic cells. Instead of destructive XPS depth profiling, a sounder understanding is possible using bulk sensitive hard X-ray photoemission at various detection angles.

References:

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