Role of surface p-n heterojunctions in the gas sensing with SMOX based devices - the examples of SnO_2: Au, Pt and WO_3: Rh, Pd, Pt.

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Resistive gas sensors based on semiconducting metal oxides (SMOX), such as SnO_2, WO_3 and In_2O_3, are widely applied for the detection of flammable or toxic gases such as hydrogen, methane or carbon monoxide. In order to overcome the disadvantages of pristine SMOX, such as low selectivity, strong interference with water vapour and poor stability, the semiconducting oxides are loaded with catalytically active metals, such as Pd, Pt or Au; this procedure is often referred to as doping. In normal operation conditions, the first two are found at the surface of the supporting oxide in oxidized form building a p-n type of surface heterojunction. Their presence has a marked impact on both the surface chemistry and conduction through the sensing layer.

The presentation will give an update of the concepts related to the role of surface p-n heterojunctions in controlling the sensing properties of the resulting sensors. Experimental results obtained with the help of various operando investigation techniques will be presented and interpreted with the help of novel mechanistic concepts for the exemplary cases of SnO_2:Au,Pt and WO_3: Rh, Pd, Pt.