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SESSION 1: ***Advanced materials for sensing technologies***
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Metal Oxides Nano and Heterostructures for Chemical Sensing

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In the field of chemical sensors, nanostructure metal oxides (MOX's) such as nanowires, nanotubes etc. are promising materials due to their ease of synthesis, low cost, fast response, high sensitivity, and exceptional physical/chemical properties. In particular, most of MOX exhibit a reversible interaction between their surfaces and the surrounding atmosphere, thus ideal to develop an efficient chemical sensing device. However, regardless their recent success, MOX bas chemical sensors suffers from selectivity issue. Various strategies such as modulating the sensing temperature, morphological control, catalyst doping/loading etc. have been employed to increase the sensor response and selectivity. Another effective strategy to enhance the sensor response and selectivity is to construct the heterojunction between two different oxides and their surface functionalization with self-assembled monolayers (SAM's). Heterojunctions enables the control of conductivity at p-p, p-n, and n-n interfaces, while SAM's molecules enhance the surface specific interactions of MOX's with gas analytes.

Herein, we are presenting a novel growth and characterization of different nanostructured MOX's, their surface functionalization with SAM's and heterostructures for chemical sensing applications. In particular, growth of nanowires (NiO, WO_3, Bi_2O_3 and ZnO), nanotubes (TiO_2), SnO_2/Go, WO_3-doped with Nb, branched-like heterostructures (NiO/ZnO) and Core-shell (NiO/SnO_2) and their integration into sensing platform are presented. To develop and explore these nanostructures, different growth and characterization techniques were used. Finally, the gas sensing performance of these prepared nanostructures were examined under the influence of different compounds such as (NO_2, H_2, CO, VOC's). As an example in our recent work, the sensing properties of ZnO NWs were improved by functionalizing with 3-aminopropyl) trimethoxysilane (APTES). The whole process creates the amino (-NH_2) terminated ZnO surface (SAM). These functionalized conductometric sensing devices showed highly selective response toward acetone as compared to the pristine ZnO NWs.