Chemoresistive Humidity, NO_2 and H_2 Sensor Based on 2D-$CrCl_3$ Layered Trihalides Nanoflakes

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Abstract

The humidity and gas sensing response of few layers transition metal trihalides (TMTHs) are still unknown, probably on the assumption that their environmental instability in dry/wet air prevents their utilization as reproducible gas sensor interfaces. In this talk we demonstrate that few-layers 2D-$CrCl_3$, a TMTHs belonging to the general formula MX_3 (M= Ti, V, Cr, Mo, Fe, Ru and X = Cl, Br, I), exhibit unveiled capabilities as chemoresistive *p*-type sensors to humidity (10 - 80% RH @25 °C), NO_2 (400 ppb – 1 ppm) and H_2 (10 – 250 ppm) at 100 °C operating temperature (OT). Specifically, we investigated the humidity response mechanism unraveling the nature of the reversal of the resistance from an ionic (@25 °C OT) to an electronic conduction regime (@100 °C OT) in humid air conditions. All these findings suggest 2D-$CrCl_3$ platforms as 2D novel interfaces for humidity and gas sensing applications.

Keywords: 2D-$CrCl_3$, chemoresistive, humidity sensor, NO_2, H_2 gas sensor.