Perovskite oxides and perovskites for gas sensing

J. Casanova-Chafer

MINOS research group, Department of Electronics Engineering, Universitat Rovira i Virgili, 43007 Tarragona, Spain

juan.casanova@urv.cat

In the last decades, among the different types of metal oxides researched for gas sensing, significant efforts have been focused on the development of gas sensors employing perovskite oxides. Perovskite oxides present high flexibility to modify their composition (Figure 1), allowing a fine-tuning of their chemical, electrical, and morphological properties [1]. In consequence, perovskite oxides have been employed to detect a wide variety of harmful gases and atmospheric pollutants.

Nevertheless, significant drawbacks are still a challenge, as the high operating temperatures needed and poor specificity. Thereby, emerging nanomaterials such as halide perovskites are breaking through due to their capability to be operated at room temperature (i.e., inducing lower power consumption and cheaper fabrication costs) and the possibility to employ different anions and cations for improving their specificity towards target analytes [2].

However, halide perovskites show specific problems such as low stability when exposed to high levels of ambient moisture. Recent results have shown that the creation of nanohybrids comprising perovskites and graphene is a promising approach for developing sensitive and stable gas sensors able to be operated under room temperature conditions [3]. The objective of this seminar is to review these materials, discuss gas sensing results and mechanisms, identify challenges and suggest research directions.

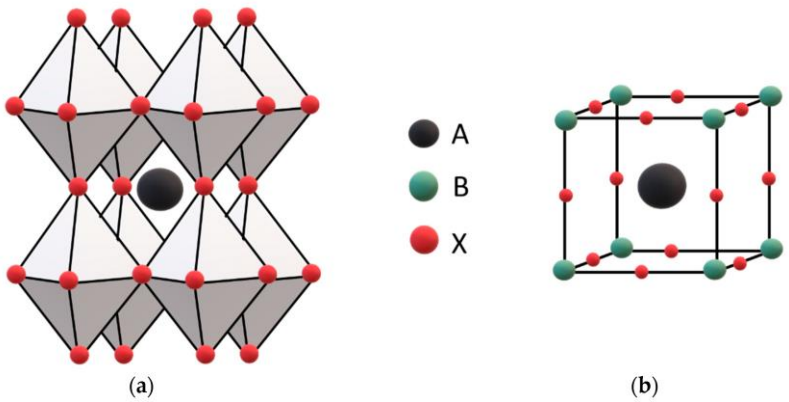

Fig. 1. Perovskite arrangement in ABX_3 structure: (a) 3D crystalline lattice; (b) unit cell of perovskite. Reproduced from Chemosensors 2021, 9(8), 215.

[1] J. W. Fergus, Sens. Actuators B Chem., **123**, 1169-1179 (2007).
[2] J. Casanova-Chafer, *et al.*, ChemComm, **56**, 8956-8959 (2020).
[3] J. Casanova-Chafer, *et al.*, Sensors, **19**, 4563 (2019).