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ABSTRACT BOOK

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Processing of Rh-doped perovskite protective filters for selective gas sensing

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Abstract:

Owing to its excellent properties, $BaTiO_3$ is used for manufacturing of thermistors and dielectric ceramic capacitors, photocatalysis, and in gas sensing. The incorporation of precious metals into the perovskite structure enables the stabilization of $BaTiO_3$ catalysts due to the self-healing mechanisms: the formation of well-dispersed metal nanoparticles under reducing conditions and re-incorporation of metal nanoparticles into the crystal lattice under oxidizing environments. This concept is successfully proven for gas sensing/monitoring of reformate products (CO and H_2) and during hydrogen separation and purification. Significant decomposition of traditional SnO_2 sensors under such reducing conditions necessitates the use of protective coatings to improve the performance as well as avoidance of sensing layer degradation. In this sense, the perovskite group of materials display several advantages such as: ease removal of oxygen, oxygen vacancies, electron mobility, and valence control that could improve gas sensing. This work reports on the synthesis of Rh-incorporated $BaTiO_3$ by oxalate-assisted co-precipitation method and processing into microgranules for better application of protective filters on to gas sensors. The synthesis process was performed in two steps: (1) preparation of precursor solutions with following mixing; (2) co-precipitation by pouring an oxalic acid ethanol solution in the cationic precursor solution with subsequent precipitate filtration, drying and calcination. The micro-granulation process is carried out in a laboratory spray-dryer. Soluble organic polymers are added as processing-aids as well as sacrificial pore-formers that lead to a structural porosity that enhances gas diffusion within the Rh-incorporated $BaTiO_3$ granulates.