

Synthesis and characterization of some compounds derived from iron-based perovskite

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1- Abstract:

Perovskites are mixed-metal oxides that are attracting much scientific and application interest owing to their low price, adaptability, and thermal stability, which often depend on bulk and surface characteristics. These materials have been extensively explored for their catalytic, electrical, magnetic, and optical properties. They are promising candidates for the photocatalytic splitting of water and have also been extensively studied for environmental catalysis applications. Despite the extensive uses, the commercial success for this class of perovskite materials has not been achieved for many other environmental applications. Owing to their high thermal stability, excellent oxidation activity, and low price; perovskites have been explored for a variety of environment-related and energy-related applications, including automobile exhaust purification, N₂O decomposition, and water–gas shift reactions, electrodes of solid oxide fuel cells (SOFCs), battery electrodes and sensor materials.

The subject of the thesis is the synthesis and characterization of some compounds derived from iron-based perovskite. The main objective is the synthesis of new materials of type A'A''Fe_{1-x}B_xO_{3-d} where A can include Ca, Ba, Bi, Sr, La and B = Mn, Al, Bi ...etc. We will delve deeper into a new research axis where we will study the possibility of application of synthesized samples in the environmental field. Sol-gel method was chosen as a synthesis route because, in general, it is a suitable method for the synthesis of nanopowders with a well-developed high specific surface area obtained at low calcination temperature and short times without employing expensive sacrificial structure-directing agents or template structures. The resulting samples will be characterized by powder X-ray diffraction (PXRD), energy dispersive X-ray spectroscopy (EDX), (FTIR), scanning electron microscopy (SEM), N₂ adsorption/desorption and photoelectrochemical tests.

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2- **Keywords:** Crystal Structure, X-Ray Powder Diffraction, Perovskite-Like, environmental applications, energy applications.

3- **Thesis outline**

1st year :

- Bibliography.
- Synthesis of some samples.

2nd year :

- Synthesis of other samples.
- Structural characterizations.
- Analysis of results and interpretation.
- Submission of an article.

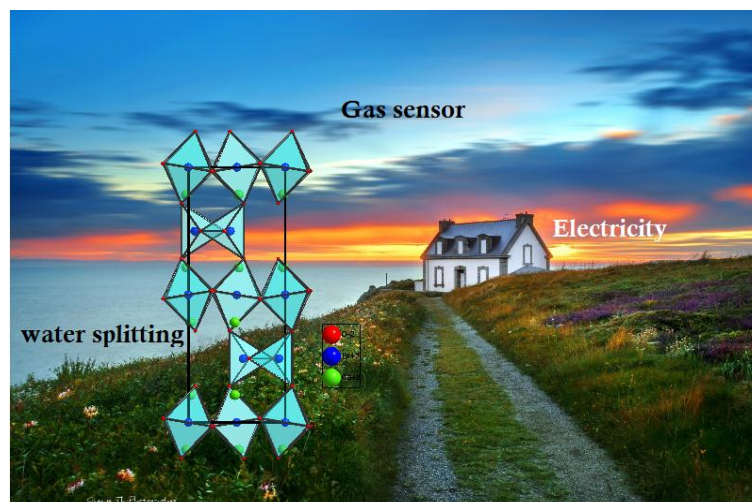
3rd year :

- Writing of the thesis.

4- **Challenges / Obstacles encountered so far:**

- Lack of some chemicals products.
- All of 8 master students + 5 PhD students working with a one oven and two laboratory hot plates.
- No space in the laboratory: The average of working area is equal to 1 m².

5- **Graphical Abstract**



6- **References**

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- [2] N. Labhasetwar, G. Saravanan, S. Kumar Megarajan, N. Manwar, R. Khobragade, P. Doggali & F. Grasset , Perovskite-type catalytic materials for environmental applications, Sci. Technol. Adv. Mater. 16 (2015) 036002.