The economic value of ferrite materials in the industrial and environmental sectors.

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Ferrite materials have various applications in both environmental and industrial sectors depending upon different parameters such as the preparation technique, precursors and calcination temperature …..etc. Thus, the ferrite materials have the soft power of sustainable economic development depends on their integration into many applied fields. Our school had a lot of researches in the technology of manufacturing these materials. This report aims to shed light on one of the important ways to prepare ferrites and how to characterize these materials and also the most important industrial and environmental applications.

The science and technology of nanomaterials has brought about a great scientific and technological revolution in all areas closely related to economic development. Ferrite materials had the largest share in this scientific development, especially in the field of materials manufacturing. The main objective was to obtain ferrite materials in the nano- scale to reach a product with a high specification that gave much higher efficiency than the conventional product in the classical scale. The preparation techniques were the driving force to obtain the ferrite nano particles. Various methods had used to preparation of the ferrite materials. Different techniques have been suggested for the preparation of nanophase materials namely vapour deposition, ball milling technique, reversed micelles, Langmuir–Blodgett film, self-assembled monolayers and sol–gel process. Moreover, the combustion synthesis (CS) has also been used for the preparation of nano-composite materials [1-7].

Combustion synthesis or self-propagating high-temperature synthesis (SHS) is an effective, low-cost method for production of various industrially and environmentally useful ferrite materials [8-12]. The solution-combustion is a two-step process *viz.* (i) formation of a precursor with different cations involved divalent cation, ferric cation and also fuel, and (ii) auto-ignition depending upon promotion this ignition by heating of the mixed precursors at moderate temperatures. The formation of the precursor (viscous liquid or gel), is a primary condition for an intimate blending of the starting constituents and preventing the random redox reaction between a fuel and an oxidizer. The very high exothermic generated during combustion manifests in the form of either a flame or a fire and hence, the process is termed as auto-ignition process [13-15].

Our research group has attended many ferrite materials and has been characterized and studied the surface, catalytic and magnetic properties of different ferrites. Glycine and urea were the most important materials as fuels used in the preparation process [8-12].

The different trends on using of ferrites for environmental protection technology were reviewed, 1) treatment of the waste water by removing of different heavy metals such as lead, chromium and cadmium via adsorption or ferrite processes, 2) formation of carbon as solar hydrogen carrier in presence of excess ferrites via the decomposition of carbon dioxide, 3) solar energy conversion into hydrogen energy and 4) hybridization process for mixing solar and fossil energies [16]. Production of new advanced ferrite composite materials which can use for manufacturing various types of industrial products like: Electric motors, Electric guitar pickups and Sensors….. etc, is one of the important materials in the industrial sector.

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