Hetero - atom induced ferromagnetism in antiferromagnetic hematite

Technology reference #1765

Problem Addressed

α- Fe2O3 possess various interesting properties like wide band gap, absorption in visible region, fluorescence, corrosion resistant, biocompatibility, low cost which makes it suitable candidate for technological applications. However, due to its antiferromagnetic nature magnetic field assisted potential applications are limited. Hence enhancing the magnetic properties of antiferromagnetic α-Fe2O3 can foster vast applications in the field of magnetism.

Technology

The present invention relates to a single step method for synthesizing ferromagnetic hematite iron oxide (α- Fe2O3) by combustion or pyrolysis. The combustion synthesis of α- Fe2O3 includes heating a composite admixture including at least one iron precursor and at least one heteroatom precursor in a predetermined weight ratio to a predetermined temperature range under an inert gas atmosphere. Further, the admixture is subsequently exposed to atmospheric air. The pyrolytic synthesis of α-Fe2O3 includes heating a composite admixture including at least one iron precursor and at least one heteroatom precursor in a predetermined weight ratio to a predetermined temperature range under an air atmosphere. The method includes inducing ferromagnetism by inclusion of heteroatoms probably in the sites of crystal defect of α- Fe2O3. The method results in a large yield of magnetic α-Fe2O3 having high magnetization. The synthesized α-Fe2O3 may be used in nano biosensors, batteries or giant magnetoresistance devices.

Advantages

1. A simple, facile single step and low-cost method of producing magnetic hematite iron oxide (α-Fe2O3).

2. Synthesized α-Fe2O3 has a purity of at least 90%

3. The methods result in a large yield of magnetic α-Fe2O3 of at least 30-40 % of the total reactants.

Applications

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- The synthesized α-Fe2O3 has potential application in nanomagnetic devices, nano biosensors, batteries, magnetic field-controlled ion separation, giant magnetoresistance devices, and magnetic field controlled photocatalytic reactors and biomedical applications.

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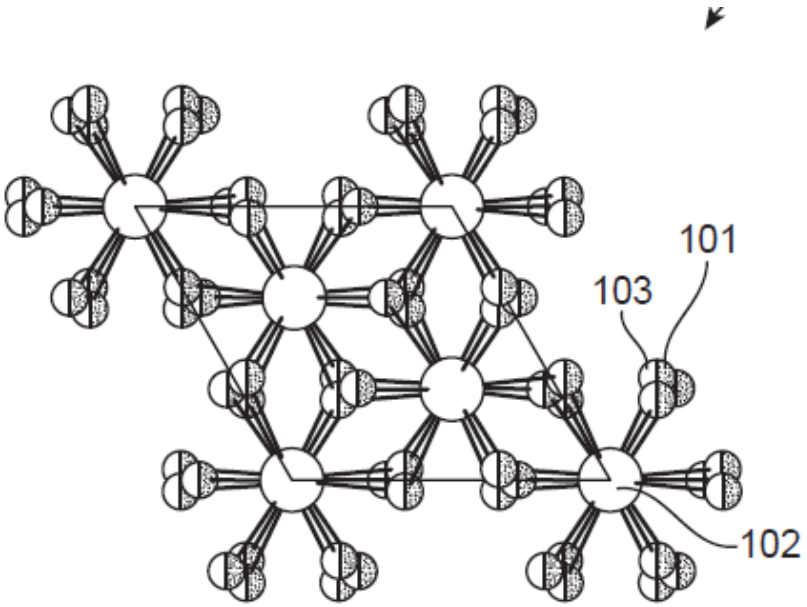
Domain

Chemistry / Chemical Engineering

Image



IIT Madras is seeking parties interested in licensing and commercialization of this technology.

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