**Green synthesis using palm kernel oil of Fe-doped Co3O4 nanoparticles**

**and structural characterization**

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**There is an increased interest in efficient green chemistry because it involves clean technology and is environmentally friendly/benign, economic and simple. In this study, a bio-derived precipitating agent/ligand, palm kernel oil, has been used as an alternative route for the green synthesis of nanoparticles of Iron-doped cobalt oxide (Fe- Co3O4) via the co-precipitation reaction. The palm oil was extracted from dried palm kernel seeds by crushing, squeezing and filtration. The reaction of the palm kernel oil with potassium hydroxide, under reflux, yielded a solution containing a mixture of potassium carboxylate and excess hydroxide ions, irrespective of the length of saponification. After neutralization of the as-obtained solution with nitric acid, an aqueous solution containing of iron and cobalt ions was added to yield the desired metallo-organic precursor, iron cobalt carboxylate. Characterization of the precursors by IR attests of the presence of the entire organic group as expected while gas chromatography (GC) gives the profile of carboxylate group in the proportion predicted by literature and ICP confirms that the metallic ratios are as expected. The thermal decomposition of the precursors was monitored by thermogravimetry (TG) between 400 °C and 600 °C. Analysis of the decomposition products by XRD, EDX, TEM and ToF-SIMS, established the obtaining of cobalt iron oxide nanoparticles (Co(1-x)Fex)3O4 for x≤0,2 and a nanocomposite material Co(1-x)Fex)3O4/Fe3O4 for x≥0,2, with size between 22 and 9 nm. XRD suggests that there is only one spinel phase while ToF-SIMS provides a direct evidence of the progressive substitution of cobalt by iron in the Co3O4 crystal structure for x≤0,2.**