Abstract

Cobalt oxide nanoparticles (Co_3O_4 NPs) using *Moringa oleifera* leaves extract was synthesized. The resulting Co_3O_4 was characterized by TGA thermal analysis, and X-ray diffraction (XRD). The thermal decomposition temperature of the sample was determined and it was found at 450 ^oC. Moreover, the crystallite sizes of the resulting cobalt oxide were also calculated by using Scherer formula. The sizes were about 23.76, 11.62, and 18.93 nm at 25, 50, and 100 ml of plant extracts, respectively. Therefore, it is possible to synthesis a cobalt oxide with cost effective and environmental friendly way by using moringa leaf extract as stabilizing agent.

Objectives of the project

General Objective

Green synthesis and characterization of Co_3O_4 nanoparticles using aqueous *Moringa Oleifer*a leaves extract.

Specific Objectives

- ✓ To synthesize Co_3O_4 nanoparticles using aqueous *Moringa Oleifer*a leave extracts
- ✓ To characterize the synthesized Co_3O_4 nanoparticles using TGA- DTA, XRD
- ✓ To study the effect of extracted concentration on the Co_3O_4 crystallite size.

Experimental Methods

Chemicals and instruments

Cobalt nitrate [$Co(NO_3)_2 \cdot 6H_2O$], sodium hydroxide (NaOH), Distilled water, Ethanol, *Moringa Oliefera* plant extract, XRD, Oven, Magnetic stirrer, furnace, funnel, filter paper, 150, Spoon, Differential Thermal Gravitometry (DTG), Bickers, Ceramic crucible.

Experimental procedure

- ✓ Plant leaves were collected and washed with distilled water.
- ✓ The plant leaf was boiled with hot plate under continuous stirring until a green color was appeared.
- ✓ Cobalt nitrate was added to each bicker containing boiled plant extract having 25 , 50 and 100 ml of plant extract under continuous stirring.
- ✓ Then, 1M NaOH (5 droplets) were added to form precipitate
- ✓ The resulting precipitates were filtered, washed , and dried at 100 ^oC for 13 hr in the oven.

Characterizations

- ✓ Thermal Gravimetric Analysis (TGA) characterization was performed under the temperature range of room temperature to 1100 ^0C .
- ✓ The samples were annealed at 450 ^oC .
- ✓ XRD analysis was performed to identify the phases and structure of the materials

Results and Discussion

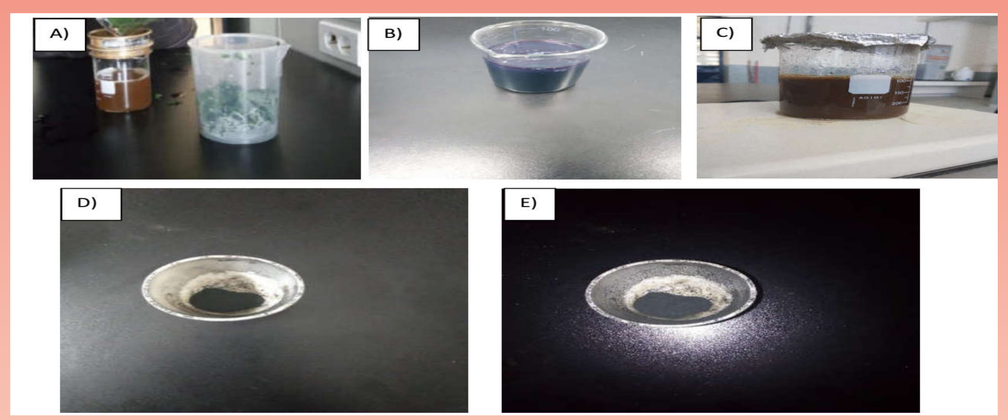
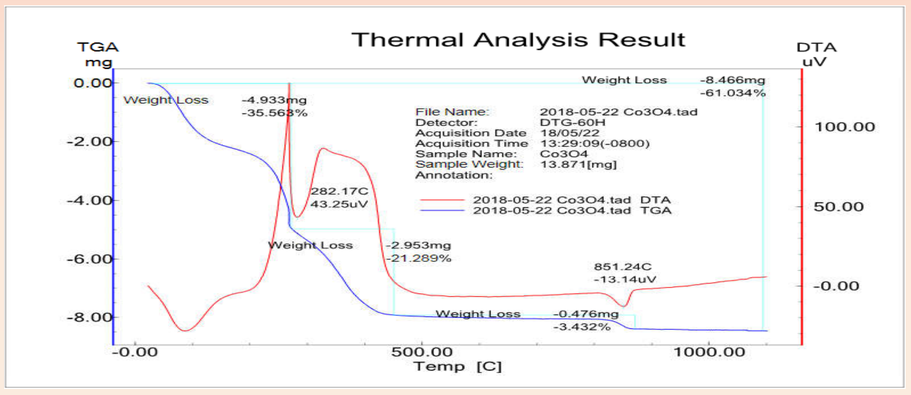


Figure 1. A) Plant extract, B) Plant extract + precursor, C) Precursor without plant extract, D) Powders formed with annealing, E) Powder formed without annealing.



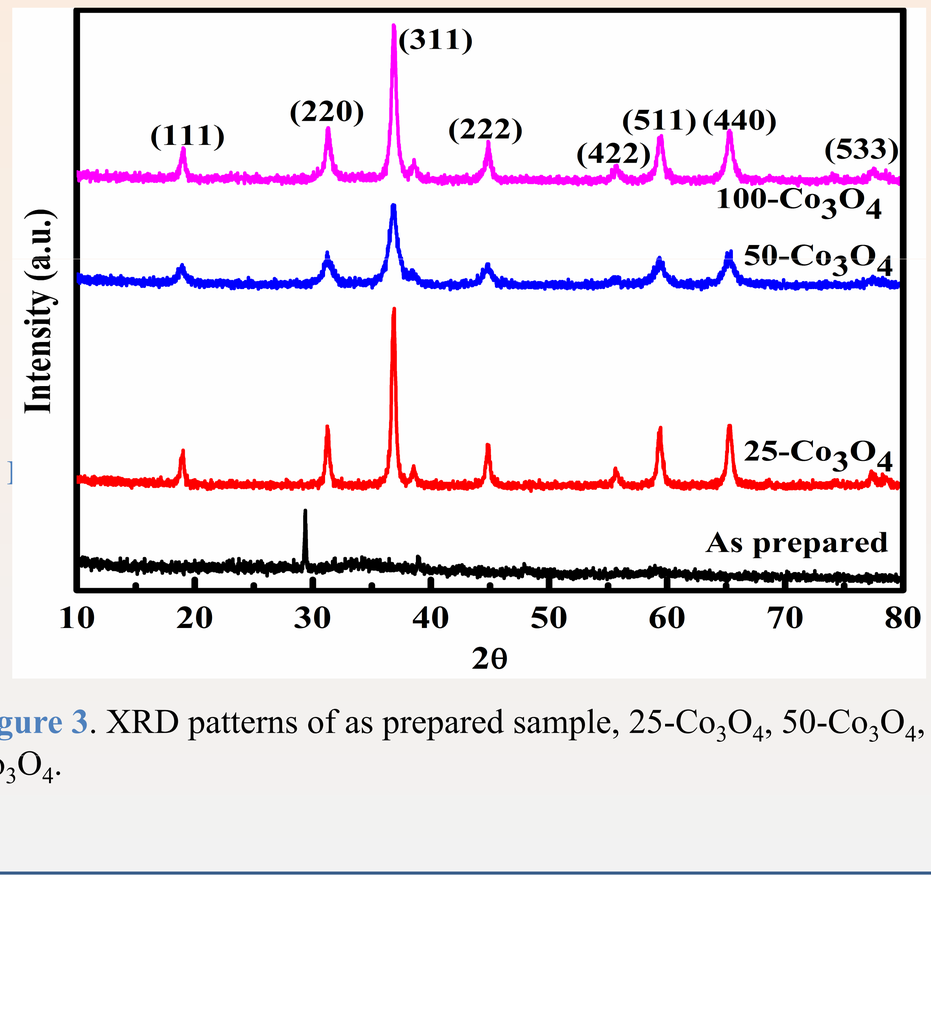


Figure 3. XRD patterns of as prepared sample, 25-Co_3O_4, 50-Co_3O_4, and 50-Co_3O_4.

Conclusions

Cobalt oxide (Co_3O_4) nanoparticles were successfully synthesized by using a green synthetic method form *Moringa Oleifera* extracts. For the resulting cobalt oxide, the smaller crystallite size was found at 50ml (volume of extract). However, the larger crystallite sizes of the Co_3O_4 were obtained at 25 and 100 ml of plant extracts. Therefore, a more preferable size at 50 ml of extract is recommended for different applications such as better antibacterial application, catalytic activity, and thin film solar cell absorber.

Biography

My name is Bawoke and I have graduated my BSc degree in Adama Science and Technology University in Materials Science and Engineering department. I am 25 years old.



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