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Chromium oxide regulated nanoparticles biosynthesis in Manihot esculenta leaf extract

K. Thara ^{a,b,*}, Ignatius Navis Karthika ^c, C. Ramesh ^d, M.S. Dheenadayalan ^e

- ^a R&D Centre, Bharathiar University, Coimbatore, Tamilnadu, India
- ^b Department of Chemistry, SSM Institute of Engineering and Technology, Dindigul, Tamilnadu, India
- Department of Chemistry, PSNA College of Engineering and Technology, Dindigul, Tamilnadu, India
- d Department of Chemistry, SSM College of Engineering, Komarapalayam, Tamilnadu, India
- e PG & Research Department of Chemistry, G.T.N Arts College, Dindigul, Tamilnadu, India

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ABSTRACT

The green synthesis of nanoparticles using plant extracts plays an important role in the field of nanotechnology. The potential of biomolecules present in plant extracts in reducing metal ions to nanoparticles in a single step of green synthesis process is very important. In this study we report on synthesis of Chromium oxide nanoparticles (Cr2O3) by reduction of potassium chromate solution with Manihot esculenta leaf extract. The presence of water soluble carbohydrates which have an aldehyde group may lead the formation of Cr₂O₃ nanoparticles. The fabricated Chromium oxide nanoparticles were confirmed by UV-Vis spectroscopy, X-ray diffraction (XRD), Fourier transform-infrared spectroscopy (FTIR) and Scanning electron microscopy (SEM).XRD and UV-Visible absorption studies. The images showed that the size of NPs of Cr₂O₃ varied with average crystalline size 85-100 nm of nanosized Cr₂O₃. © 2021 Elsevier Ltd. All rights reserved.

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1. Introduction

Presently metal and metal oxides in NPs have outstanding approaches in various fields owing to their electrical, optical, thermal abilities [1]. Among the metal oxides, Cr₂O₃has perceptible properties to attract the researchers. Its thermal stability, hardness, chemical resistance and antiferromagnetic property lead to Cr₂O₃ NPs synthesis in various applications [2]. The attractive adaptable properties of Cr_2O_3 NPs have led to the green synthesis. The crucial attractions of Chromium oxides (Cr2O3) have an importance in science as well as in technology [3-4]. Distinguishable parts of the plants (leaves, fruit, roots, latex, seed and stem) are having prospective medicinal values. The fabrication of Cr2O3 nanoparticles have been developed by diverse technique such as thermal decomposition [5], hydrothermal method [6-8], solvothermal method [9], thermal process [10-12], microwave irradiation method [13], precipitation method [14], magnetron sputtering [15], combustion solution method using glycine [16], laserinduced deposition[17], sonochemical synthesis [18], sol-gel syn-

thesis[19], combustion synthesis [20], thermal reduction [21], urea-assisted homogeneous precipitation [22] and precursor calcinations [23].Chromium (Cr₂O₃) possess specific applied applications such as liquid crystal displays [24], in high-temperature resistant materials [25], coating materials [26], corrosion resistant materials [27], green pigment [28], solar absorbers [29], heterogeneous catalysts [30], ceramics, coatings, printing and paint indus-

In contrast with the conventional method, bio synthesis is friendlier to environment because it utilizes plants extract as the chemicals substitute. The plant extract containing destructive compounds helps the reduction of chromium ions in the fabrication of Cr₂O₃ NPs. The Manihot esculenta leaves possess biomolecules such as carbohydrates, proteins and lipids [34-35], which could be used as reducing agent to react with chromium ions and act as scaffolds to direct the formation of Cr₂O₃ NPs in solution.

2. Materials and methods

2.1. Preparation of Manihot esculento extractill KUMARAN, M.E., Ph.D., (NUS

Healthy leaves of Manihot esculenta were collected and washed several times with distilled water to remove the adhering dust parechnology

Kuttathupatti Village, Sindalagundu (Po),

Palani Road, Dindigul - 624 002.

E-mail address: tharadinesh17@gmail.com (K. Thara).

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engineering an * Corresponding author at: R&D Centre, Bharathlar University, Coimbatore, Tamilnadu, India.