ENVIRONMENTALLY BENIGN REUSABLE COPPER NANOPARTICLES-CATALYZED SYNTHESIS OF THIOCHROMANONES IN WATER

IITM Technology Available for Licensing

Problem Statement

- Conventional **synthesis of thiochromanones** is inefficient and time-consuming, involving toxic and hazardous reagents, leading to high waste production and environmental impact.
- There is a **demand for an efficient** and **environmentally friendly** method to synthesize thiochromanones, requiring a recoverable and reusable catalyst.
- The development of a process **utilizing water** as a **solvent reduces waste and improves sustainability** while providing **high yields of thiochromanones** and **easy handling of starting materials.**

Technology Category/ Market

Category – Chemistry/Chemical Synthesis
Applications -Chemical research and development, Pharmaceutical Industry, Green chemistry, Nanoparticle applications, Environmental-friendly chemical processes.
Industry - Chemicals, Pharmaceuticals, Organic Synthesis.
Market -The global Organic Catalyst Market size was USD 37.5 billion in 2022 and is estimated to grow to USD 54.77 billion by 2030. This market is witnessing a healthy **CAGR of 4.85%** from 2023 - 2030.

Key Features / Value Proposition

Technical Perspective:

- The heterogeneous **Cu-BNP catalyst** enables **efficient synthesis of thiochromanones** in **water,** offering a **green and safe** alternative to traditional methods. **Easy recovery and reusability** make it **cost-effective and environmentally friendly**.

Industrial Perspective:

- The Cu-BNP catalyst presents a **competitive advantage for thiochromanone production,** with high yields and **reduced environmental impact**. Its **versatility and regulatory compliance** make it an attractive option for various industries.

Intellectual Property

- **IITM IDF Ref. 2244**
- **IN 415562 (PATENT GRANTED)**

Technology

- The invention introduces a novel **heterogeneous copper binaphthyl nanoparticle (Cu-BNP) catalyst** for **thiochromanone synthesis.**
- The heterogeneous Cu-BNP catalyst wherein the **size of the copper nanoparticle is 3.5-5nm.**
- **Green and sustainable process** using **water** as a **solvent, reduces the environmental impact.**
- **Easily recoverable and reusable catalyst** contributes to a more sustainable chemical synthesis process.
- The catalyst can be employed in the synthesis of **various thiochromanones and their derivatives**, making it applicable in pharmaceuticals, chemicals, and other research fields.
- The **starting materials** and **reaction** conditions are easy to handle, simplifying the overall process and making it accessible to researchers and practitioners in the field.
- Efficient catalyst recovery, enhancing its **economic feasibility and minimizing waste generation.**
- The invention allows for the **synthesis of different thiochromanone derivatives.**
- The method employs **odorless potassium ethyl xanthate as a sulfur source**, wherein **TBA●HSO4 is used as a phase transfer catalyst** in water **at 80°C**, reducing the risk of exposure to toxic and hazardous reagents**.**

TRL (Technology Readiness Level)

TRL- 3, Proof of concept established.

Research Lab

Prof. G.Sekar
Dept. of Chemistry, IIT Madras

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

Image

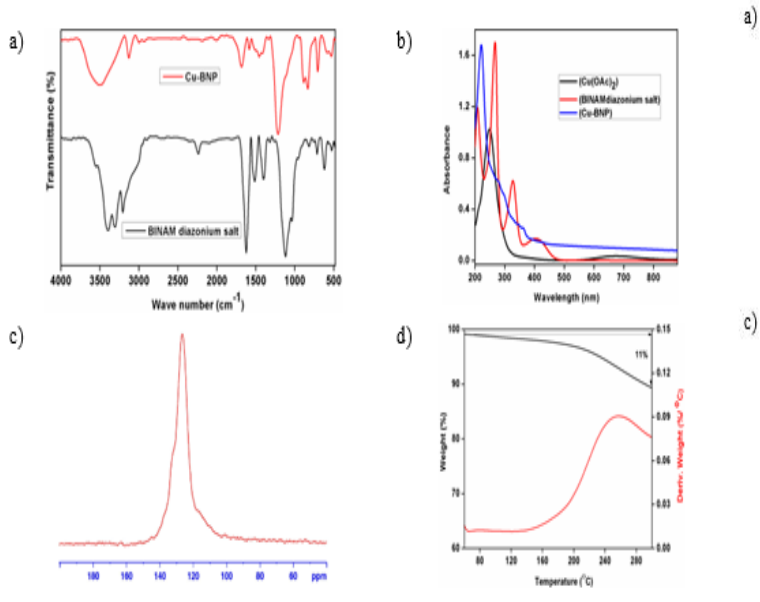

Fig 1. a) FTIR spectra b) UV-Visible spectra c) Solid state ^{13}C NMR and d) TGA analysis of newly synthesized Cu-BNP

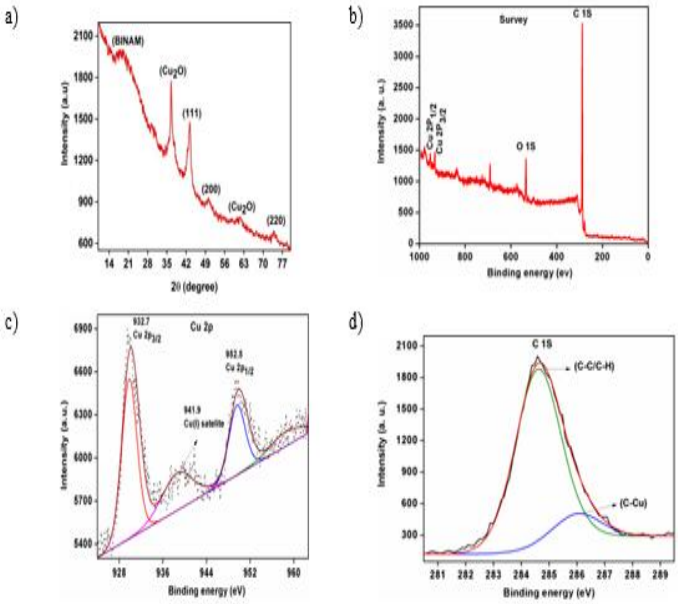

Fig 2. depicts a) PXRD pattern and b-d) XPS spectra of copper binaphthyl nanoparticle (Cu-BNP)

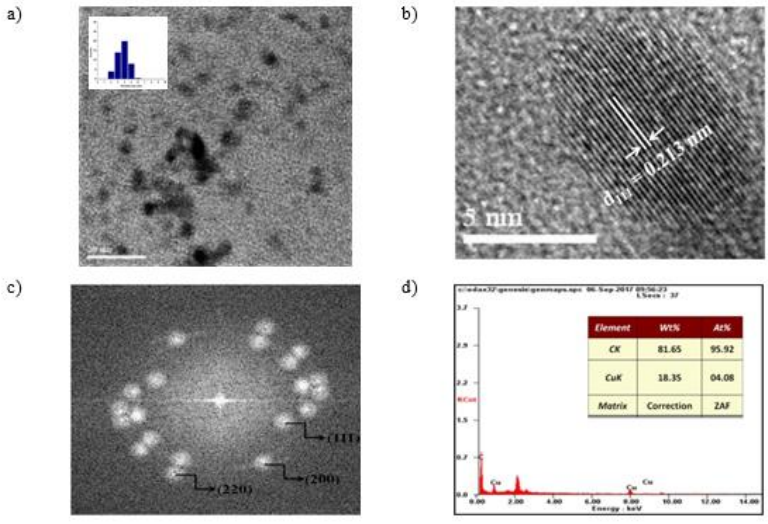

Fig 3. a) and b) HRTEM images c) SAED pattern d) EDAX analysis of Cu-BNP

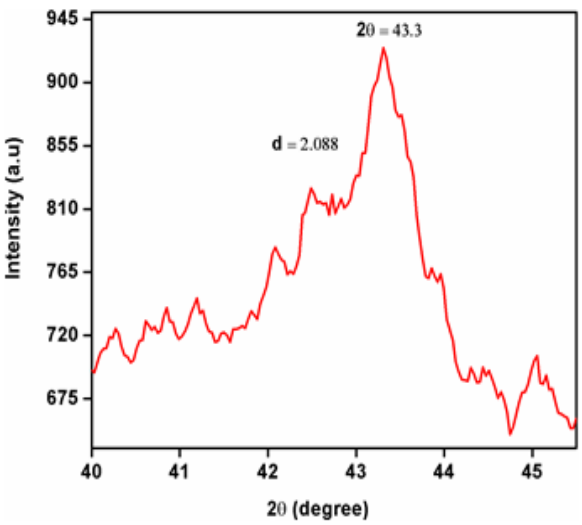

Fig 4. Calculated d and θ from PXRD pattern

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719