



**Faculty of Education
Chemistry Department**

**Synthesis and characterization of some new
metal complexes containing chromone
moiety and immobilized nanomaterials for
different applications**

Thesis Submitted

By

Mona Ahmed Ahmed Mohamed Kishk

**Master of the Teacher's Preparation in Science
(Inorganic Chemistry)
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Synthesis and characterization of some new metal complexes containing chromone moiety and immobilized nanomaterials for different applications

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Abstract

ABSTRACT

A new hydrazone ligand L containing chromone and isatine moieties and its transition metal complexes of Cu(II), Ni(II), Co(II), Zn(II), Cd(II) and UO₂(VI) as well as complexes encapsulated into zeolite cavities were prepared with crystalline or amorphous structures for different applications. The ligand and its complexes were characterized by elemental, thermal, FT-IR, UV-Vis, ¹H-NMR, EBT, ESR, TEM and XRD analysis, as well as molar conductivity, surface area, mass spectroscopy and magnetic moment measurements. The spectroscopic data revealed that the ligand behaves as a neutral tridentate ligand. Based on the analytical and spectral studies, it was concluded that the coordination sites with the metal ions are the γ -pyrone oxygen, azomethine nitrogen and isatinic oxygen. The pure metal complexes exhibited octahedral geometry except UO₂(VI) complex in which uranium ion is hepta-coordinated. Transmission electron microscope (TEM) analysis showed that Cu(II) and Ni(II) complexes have rod morphologies, while, Co(II) complex has sheets like shape. TEM images of Cu(II), Ni(II) and Co(II) complexes/NaY zeolite showed a nano morphology and confirmed that the complexes

distributed into the zeolite cavities. The antimicrobial activity of the ligand, its pure complexes and immobilized complexes into zeolite were investigated. The ligand, pure Cu^{II} and Zn^{II} complexes and immobilized Cu^{II} and Zn^{II} complexes into zeolite were tested for their *in vitro* cytotoxicity against liver carcinoma cell line (HepG2) compared with standard *cisplatin*. Cu^{II} -complex/NaY has highest antitumor activity. The toxicity test on mice showed that Cu^{II} -complex/NaY had lower toxicity than standard *cisplatin*. The catalytic activity for pure complexes and immobilized complexes into zeolite were tested for real industrial wastewater purification application. Cu^{II} and Co^{II} -complexes/NaY were the best catalysts. The pure complexes were tested as dye sensitizer in dye sensitized solar cell. Ni^{II} and Cd^{II} complexes give the best results. Finally, the obtained results showed that the prepared nanomaterials have great potential applications in the fields of biomedical and environmental sciences.

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