

# Adsorption and Interaction Studies of Crude and Waste Diesel Oil & Methylene blue Dye onto Agar-Carboxymethylcellulose-Silver Nanocomposite in Aqueous Media

**Sahar I. Mostafa**

*Chemistry Department, Faculty of Science, Mansoura University, Mansoura, Egypt.*

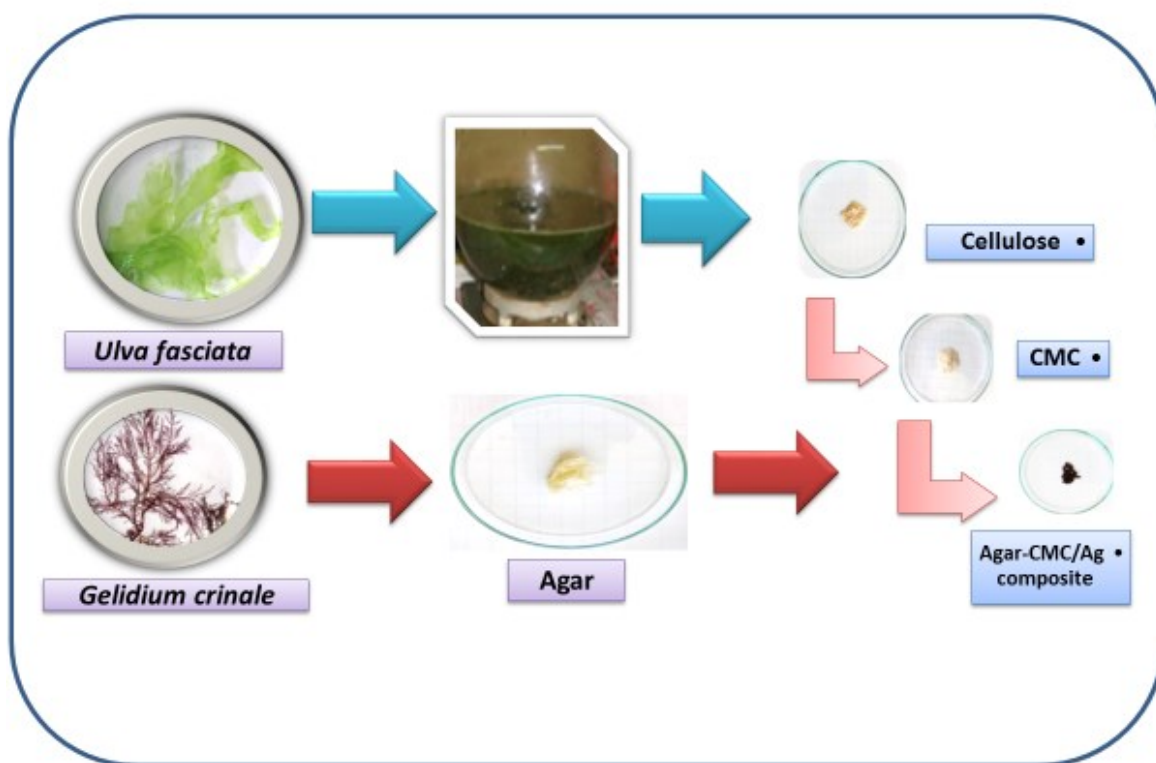
*E-mail: sihmostafa@gmail.com*

Over the last several decades, there is a rapid industrial development, dyes as pollutants have received a great attention as a main source of water contamination, which causes serious ecology damage and health problems. Large number and types of dyes in industrial wastewater cannot be degraded easily through conventional wastewater treatment based on their complicated molecular structures. In addition, Waste containing oil is generally classified as hazardous pollutants especially aquatic environment. Oils are causing ecology damages for aquatic flora and fauna microorganisms, plant, animal, as well as mutagenic and carcinogenic for human. They discharge from different sources to form a layer on the water surface, decreasing the dissolved oxygen, which are difficult to be oxidative for microbial on hydrocarbon molecules and cause environmental deteriorations to water bodies.

Thus, the main objectives of this report are;

- Fabrication of Agar-carboxymethylcellulose-silver nanocomposite (AG-CMC-Ag NP) from modification of cellulose (extracted from Egyptian macroalga *Ulva fasciata*) to carboxymethylcellulose (CMC), with silver nanoparticles, and agar (AG; extracted from *Gelidium crinale*).
- Characterisation of AG-CMC-Ag NP by using Fourier transform infrared (FTIR), UV-visible (UV-vis), X-Ray powder diffraction (XRD), transmission and electron microscopy-energy dispersive X-Ray (SEM-EDX) spectroscopy, thermogravimetric (TGA), and the zero-point charge of pH (pH<sub>ZPC</sub>) measurements.
- Investigating the adsorptive performance of methylene blue (MB), crude and waste diesel oil from aquatic medium onto the surface modified cellulose, AG-CMC-Ag NP.
- Batch sorption investigations were carried out to determine the optimum experimental conditions (pH, contact time, temperature, amount of sorbent and initial MB dye or crude and waste diesel oil concentration).

- The maximal adsorption capacity of AG-CMC-Ag NP was found to be  $66.68 \text{ mg g}^{-1}$ , forming a monolayer of adsorbed MB at  $25^\circ \text{C}$ , contact time 150 min. at pH 5.5.
- AG-CMC-Ag NP composite shows the highest adsorption capacity with  $10.95 \pm 0.47$  and  $8.95 \pm 0.54 \text{ g g}^{-1}$ , for removal of crude and waste diesel oil from aqueous media, respectively, with excellent recyclability for more than nine cycles.
- The kinetic and isotherm studies indicate that diesel oil diffused into the internal layers of AG-CMC Ag NP and can be fitted to a pseudo- first order (PFORE) model, and could be best fitted with the Langmuir model with a maximum monolayer capacity of 12.26 and  $11.04 \text{ mg g}^{-1}$ , respectively.
- In case of adsorption of MB onto AG-CMC-Ag NP, the pseudo-second-order model (PSORE) was described better the process dynamics, and the experimental data were excellent fitted within The Langmuir isotherm. The thermodynamic parameters indicated a feasible, spontaneous, endothermic and more randomness state existing at the solid–liquid interfaces.



**Preparation of nanocomposite, AG-CMC-Ag NP**

## **Biography**

### **Prof. Sahar I. Mostafa**

- Inorganic Chemistry Professor and The Head of the Chemistry Department, Mansoura University, Egypt; Visiting Prof. McGill, Canada; Ioannina, Greece; Imperial College, UK. She was awarded B. Sc. (Excellent with honor), M. Sc. (Mansoura) and Ph D (Imperial College, UK); and IKY & JICA fellows.
- She has invited lectures worldwide (45), publications (90), Editor in Chief of Chemistry Journal of Mansoura University and editorial board member (30) scientific journals, and Thesis advisor (40).
- She developed several aspects of O,O; N,O and N,S-donors complexes with low cytotoxicity. Research interest in biologically active complexes , catalysis and environmental using Modified Solid Supports (MSS).
- She has organized 6 International Conference. Her academic efforts have been recognized by Mansoura-Univ PLATES (2013, 2017, 2018, 2019; best Teaching-1992), Egyptian-Chemistry Union (2021, 2022), JICA (2000), Imperial College (1993, 2008), Who's is Who's in the world (2008), Al-Azhar-Univ (2007, 2009, 2011), Africa-Pharmacology (2016) and ACS-Aligarh Muslim University (India 2020).

## **Presenting Author Details and Photo**

***Full Name: Sahar Ibrahim Hamed Mostafa***

***Email ID: sihmostafa@gmail.com***

***Phone No: +20100-8502625***



