

# **Utilization of agricultural and plastic wastes to prepare adsorbents for industrial waste water treatment**

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## **Abstract**

One of the big challenges that Egypt faces is organic and industrial wastes management. In recent years, as a result of environmental pressure to improve waste management, utilizing the locally abundant agricultural and industrial wastes has intensified. The biomass is produced in large amounts every year as byproducts of industry, agriculture and forestry. The development and utilization of these large amounts of natural and waste biomass is not only a resource problem but also an urgent environmental problem, such as, reduction in air pollution, and greenhouse gas emission. On the other hand, plastics (PET) are largely used in our daily life which causes a serious environmental impact across the land and seas because it is a non-biodegradable polymer. So, the recycling of agricultural and industrial wastes and use them as raw materials in the adsorbent preparation not only reduce the cost, but also reduce the side effects of wastes.

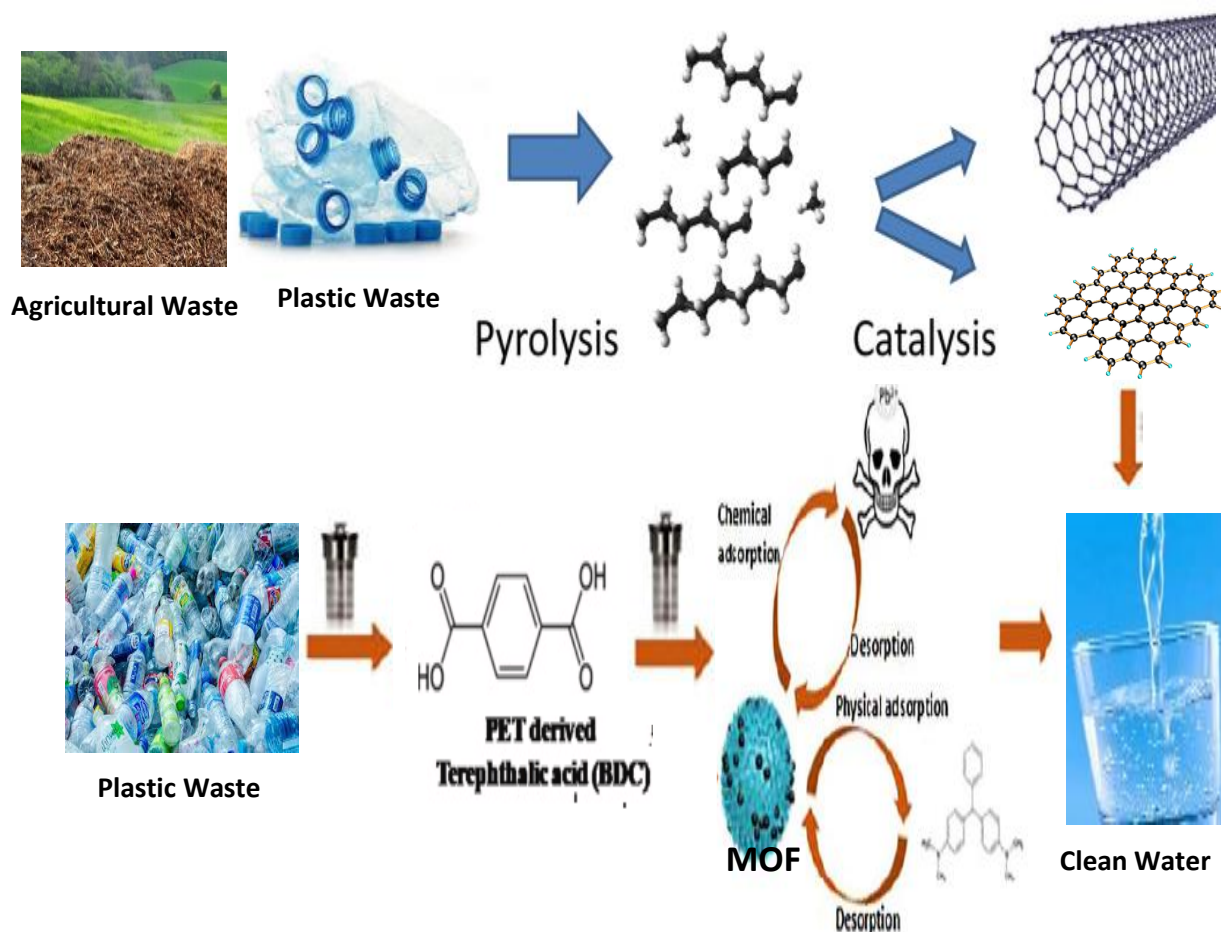
The adsorption is one of the simplest and efficient techniques for the removal of organic contaminants in the industrial wastewater. Also, in the adsorption process, it is possible for adsorbent regeneration and pollutant recovery.

Production of low-cost adsorbents such as metal–organic frameworks (MOFs) and carbon-based materials (CNMs) with high adsorption capacity from biomass and plastic waste (PET) have received great attention due to their potential application for wastewater treatment. Also, the incorporation of CNMs into MOFs will be used as efficient adsorbents for removal of organic pollutants from the industrial wastewater.

Biomass and plastic waste (PET) will be utilized as a starting materials in the green synthesis of metal–organic frameworks (MOFs) and carbon-based materials (CNMs). MOFs has received significant attention in wastewater treatment due to its distinct properties. Green synthesis of MOFs from plastic waste to reduce the cost is an important issue. Recently, the plastic waste (PET) has been effectively utilized as a starting material of the terephthalic acid (TPA) and its derivatives for the green synthesis of MOF.

Moreover, a method of two-stage can be utilized for the production of CNMs via pyrolysis of cheap and abundant agricultural or plastic wastes, where the economic return of this process is expected to be large. A two-step CVD technique for the production of CNMs from biomass generally includes two processes, i.e., thermal conversion of biomass into vapors and catalytic conversion of the vapors into CNMs in the presence of a catalyst.

In this project, the incorporation of CNMs into MOFs have been studied to advance its structure and stability for adsorption applications. The hybrid CNMs / MOF can be used as an adsorbent in wastewater treatment.



## Objectives

The main objective is to develop cost-effective synthesis processes by converting plastic wastes and Bio wastes into high-value adsorbents and use them in industrial wastewater treatment from organic pollutants.

- 1) Green synthesis of metal–organic frameworks (MOFs) from plastic waste.
- 2) Develop cost-effective processes for producing carbon nanomaterials (CNMs) from different plastic and agricultural wastes.
- 3) Evaluation and characterization of the prepared CNMs and terephthalic acid.
- 4) Evaluation and characterization of the prepared MOFs and CNMs.
- 5) Investigate the efficiency of the prepared hybrid MOFs/CNMs as adsorbents in the adsorption processes for the industrial waste water treatment.