PRODUCTION OF GRAPHENE

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Graphene is at the core of a rapidly growing research, because of its unique versatile properties it became especially interesting for projected applications. Graphene was found to be undoubtedly emerging as one of the most promising nanomaterial due to its unique combination of superb properties of electrical and thermal conductivity. This innovation is one of the first discovered two dimensional (one atom thick) material, therefore it can absorb only 2.3% of light. The production of high purity graphene can be achieved by chemical vapor deposition (CVD), or by electrochemical reactor. Some examples of its forthcoming applications are in biomedical technologies, electronic industries, water treatment sector, also in material science, efficient solar panels, aerospace, sensors, anticorrosion coatings, and high capacity batteries.

This project was experimentally approached to reach the desired product of graphene, choosing the electrochemical cell method; being the easiest way for large scale production. Which is also considered to be a clean process besides its high efficient energy consumption and cost effectiveness of construction. The objectives of this project are to experimentally producing good quality of graphene nanoplatelets. Testing the product on different test mechanisms such as the adsorption of heavy metals detected by atomic adsorption spectrophotoscopy and adsorption of dyes in addition to TEM, SEM and XRD. Alongside with constructing a theoretical pilot plant based on the experimental results.

To comply with the project goals, results of the applied experiments reveal adequate outcomes based on the available workspace conditions. The produced graphene was in the form ofnanoplatelets which were tested using the aforementioned methods. Bulk density was experimentally found to be 0.147 g/cm^3, and the particle size is 0.711 micrometer. Adsorption of dye performance using graphene was observed to be exceptionally better than commercial coarse activated carbon due to its high surface area as well as better pore network distribution. Heavy metals in water with high concentration pose a threat to the human health, so an adsorption of heavy metals were carried out using graphene. Results of adsorption of cadmium, lead and iron indicated a great capacity and capability of adsorption.