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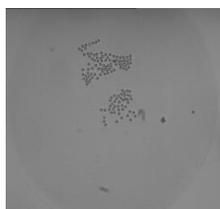
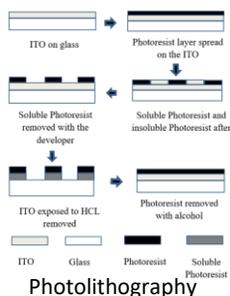
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## RESEARCH HIGHLIGHTS

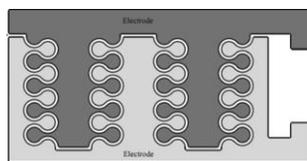
### 1. Biomedical Microelectronic Engineering

This research focused on the development of **electrohydrodynamic on lab on a chip (LoC)** for particles manipulation of biological or non biological origin. Particles have certain reaction to electric field generated by electrode with specific geometry when introduced to electrical signal or behave in certain manner when moving with fluid flow induced by the system. The sensor is electrode base fabricated by **photolithography** technique. The sample is colloidal particles suspended in various type of fluid. The electrode size and shape, the medium conductivity and permeability, the particles surface charge and the electrical signal frequencies and potential are the parameters that determine the behavior of the medium and the particle either **dielectrophoresis** or **electroosmosis** when subjected to the electric field. The research has been successfully maneuver carbon origin particles (Carbon Nanotubes, Graphene, Graphene Quantum Dots) and also successfully manipulate biological origin particles (Malaria Virus, Dengue Virus).

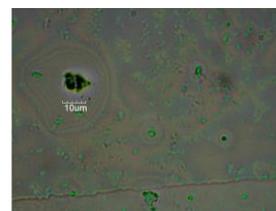
Furthermore the manipulation is done using **surface aquatic wave (SAW)** technique. Piezo material generate wave when introduce with electrical signal. The wave manipulate particles. The capillary channel were fabricated for placing the sample work in a way that particles can be trapped or channel for manipulation.



Particles trapped



Zipper electrodes

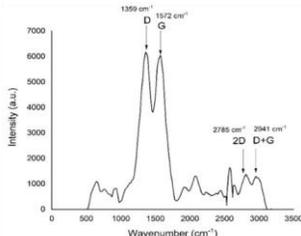
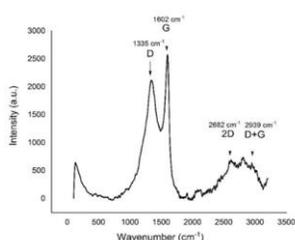


Trapped Dengue Virus

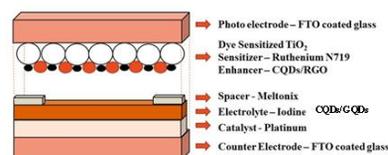
### 2. Energy optimization

The research focus on optimization of energy. It concentrate on **green technology**. **Energy harvesting** cell were develop not limited to dye-sensitized solar cells (DSSCs) but also microbial fuel cells (MFCs). The harvested energy is control by the system design to optimize the acquired energy. The energy harvesting panels were place together with aquaponic systems.

Furthermore the research also work on the backbone of the system to develop management of the electrical signal using **Organic Thin Film Transistor (OTFT)**. To further stretch the research, the **conductive polymer** is fabricated to be applied not only as flexible but also transparent material.



Raman spectrum for CQD and GQD



Structure of DSSC