SEMS: RESEARCH PROJECT DESCRIPTION

1. Project Background and Description

The impact of charged jets and drops on solid surfaces

When a drop impacts a solid surface, different scenarios can occur based on the governing parameters; the drop can bounce from the surface, the drop can splash due to the breakup of a fine liquid sheet ejected radially, or the drop can spread on the substrate in a uniform way. The last mode is the favorable one in many applications such as bio-printing, printing electronics and additive manufacturing to ensure high performance of the fabricated devices. A lot of work have been done in the last few decades to understand the physics when it comes to the impact of a drop to a solid surface but because the use of electro-jetting in printing is relatively new comparing to inkjet printing, their is still a question of how a charged drop behaves when it impacts a solid surface.

This research project aims to answer this open question as it would have a great impact on the feasibility of electro-jetting technology in the printing applications. Identifying the right operational conditions for uniform spreading of such small-scale drops would unlock their adoption into a variety of modern manufacturing process especially in 2D/3D printing on nonconductive surfaces. Also, it will improve the performance of other complex processes such as the liquid demulsification using external electric field.

2. Project Scope

The objectives of the research project are:

1. *Design and build an experimental setup for the impact process.*

2. *Conducting computational modeling of the impact using available open source codes.*

3. *Characterize the parameters affecting the impact to understand the physics in this phenomenon and print high quality electronics based on this knowledge.*

3. Desired Skills from the Student

1- *The ideal candidate will have an MSc degree (or equivalent) in Mechanical Engineering, Physics, Mathematics or a related discipline.*

2- *Strong background in fluid dynamics and applied physics.*

3- *Experience of working in a laboratory; conducting experiments and analyzing the results.*

4- *Some basic programing skills.*

4. Supervisory Team

Primary Supervisor: *Dr. Ahmed Ismail, Academic Fellow in Fluid Dynamics*

Email: *a.ismail@qmul.ac.uk*

Webpage: *https://www.sems.qmul.ac.uk/staff/a.ismail*