SEMS: RESEARCH PROJECT DESCRIPTION

1. Project Background and Description

Micro-Scale jetting dynamics from cavity collapse

The microfluidics market has evolved significantly over the past years owing to the integration of microfluidics technology in different sectors such as biotechnology, drug delivery and 2D & 3D printing. The global microfluidics market is expected to reach around $8.78 billion by 2021. One important target in microfluidics science is to design and fabricate efficient devices that can deliver low volume of fluids in the range of microliters, nanoliters, or picoliter. Unfortunately, the size of the nozzle has to be reduced to impractical scales to achieve this goal.

The research project aims to study the dynamics of a cavity collapse and the jetting of micro/nano droplets out of this collapse as an alternative way to produce smaller droplets without the need of reducing the nozzle size. The main focus of the study will be on the cavity collapse in liquid metals, trying to understand the theoretical concepts and the physics in this new regime. This study will be a key element to develop a new engineering system that capable of producing diminutive drops from different functional materials, which can be used in a wide range of applications in energy, manufacturing and health.

2. Project Scope

The objectives of the research project are:

1- *Develop a numerical model to simulate the cavity collapse and the jetting process in the new regime.*

2- *Design and build an experimental setup to validate the numerical model.*

3- *Analyze the data obtained from the experiments and the simulation to characterize the parameters controlling the jetting process.*

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*