INVESTIGATION OF THE SPIN COATING PROCESS IN PEROVSKITE SOLAR CELL APPLICATIONS

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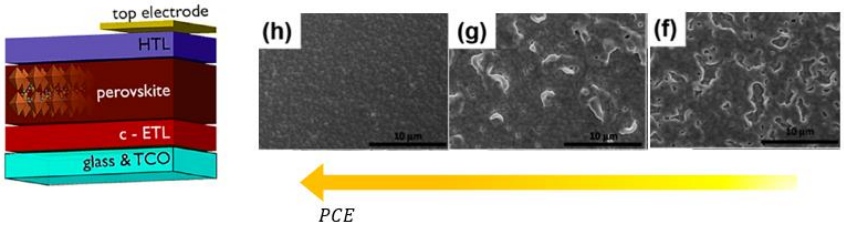
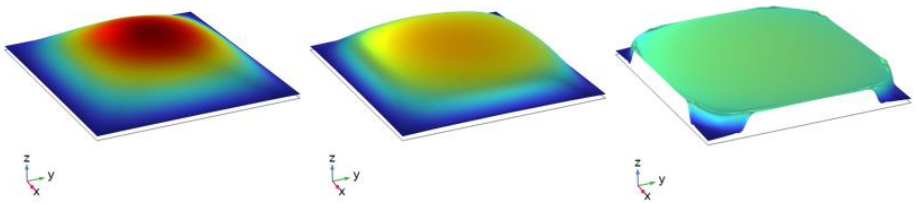
Solar photovoltaics (PV) represents the most significant and widely used technology for energy production from renewable sources. In the recent years, perovskite solar cells (PSCs) have been a promising "rising star" in the PV sector, combining low manufacturing costs and excellent performance [1]. Especially when tin is used instead of lead as the metal cation due to lower toxicity [2], the main issue related to PSCs is the uncontrollability of film morphology under spin coating during the manufacturing process. The crystallization rate of tin halide perovskites is much faster than that of the lead-based analogues, thus leading to poor film coverage and lower efficiency.



The challenge of this PhD project is to investigate the flow behaviour of perovskite precursor solutions during spinning, aiming to identify and control the process parameters to consciously manipulate crystallization and, therefore, PSC efficiency. Since the film thickness is much smaller than its longitudinal dimension and the Reynolds number is smaller than one, the first attempt is to model the process with the lubrication-theory-based approximated form of the Navier-Stokes equations [3]. The modelling couples mass and momentum balance equations with transport and constitutive equations and boundary conditions. Particular attention is also addressed to the evaporation of the solvent during the spinning process, which induces the concentration of the solute in perovskite precursor solutions.



Reference list

[1] M. Saliba et al., *Chem. Mater.*, 30, 2018

[2] L. Liang and P. Gao, *Adv. Sci.*, 1700331, 2017

[3] L. W. Schwartz et al., *Phys. Fluids*, 569, 2004

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