

Shervin Bagheri

“Porous material modeling for fluid flow control”

In the last decade or so, surfaces have been chemically or mechanically modified in order to interact with fluids for de-icing, self-cleaning, water-repellence, anti-fogging, anti-fouling, heat transfer enhancement, drag reduction, capturing molecules, etc. The interaction of complex porous surfaces with free flowing fluids also play important role in applications such as evaporation process in fuel cells, cell growth/differentiation/proliferation and in environmental flows, such as canopies, forests and mangrove ecosystems. In these applications, it is of interest to model the exchange of nutritions, ions, proteins, etc between a free-flowing fluids and the porous and elastic medium.

Despite the ubiquity of complex surfaces, we still lack physical models (e.g. constitutive laws) of how flowing fluids interact with textured, porous and soft surfaces. In particular, we lack systematic methods to link the microscopic features of a complex surface (texture, geometry, etc) to effective interfacial boundary conditions that the surface induces.

In this talk, I will present our efforts to model for textured, porous and deformable surfaces. I will demonstrate a number of applications (ranging from lubrication to turbulence) where the surface models are used.



Shervin Bagheri became Associate professor 2015 at KTH and in 2017 he started the research group Fluids and Surfaces at KTH with the aim of characterizing how flowing fluids and surfaces behave and interact. The projects span across all length scales, ranging from flows over canopies and rough-wall turbulence to soft lubrication and physiochemistry at nanoscales. While the research is driven by curiosity, the ambition is to transfer our results to innovations that will benefit both society and industry. The group uses mathematical modeling, numerical simulations and experiments to uncover fundamental physiochemical mechanisms of fluids and surfaces. Shervin is a Wallenberg Academy Fellow and one of the 20 recipients of the Future Research Leader grants awarded every three years by the Swedish Foundation for Strategic Research (SSF).