

**ICB PhD public presentations****MODELING AND ENGINEERING  
THE INTERFACIAL PROPERTIES  
OF TWO-DIMENSIONAL  
MATERIALS****Tian Tian**

ICB/The Shih Group

Supervisor: Prof. Dr. Chih-Jen Shih

Co-examiners: Prof. Dr. Mathieu Luisier and  
Dr. Elton Santos**ETH Hönggerberg, 18/09/2019**  
**HCI D 2, 17.00 h**

**Project Summary:** Atomically thin two-dimensional (2D) materials offer new technological opportunities due to their outstanding properties. Despite extensive research focusing on the intrinsic characteristics of 2D materials, little is known of their interfacial properties, which are essential for the integration into modern 3D technology platforms. In this thesis, I aim to develop theoretical frameworks bridging multiscale phenomena in order to develop new fundamental insights into such atomically thin interfaces, covering special topics including the field effect transparency, high-pass van der Waals (vdW) force penetration, dielectric anisotropy as well as doping-induced wettability. Based on the theoretical predictions, I also demonstrate three new systems experimentally, including pressure-sensitive interfacial transistors, macroscopic salt rejection through atomically thin membranes, and repulsive solid-state vdW forces. The fundamental principles and experimental findings presented here deepen our understanding about 2D material interfaces and promise to open new avenues to 2D-materials integrated systems.

**CV.** Tian received his B.Sc. of Chemical Biology and M.Sc. of Chemistry from Tsinghua University, China. In 2015 he joined the group of Prof. Dr. Chih-Jen Shih for his PhD studies.