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Using a qPlus Sensor to probe a Delta-Doped System and a large Dipolar Molecule adsorbed on a 2DEG

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The addition of a qPlus sensor to a tunneling microscope (STM) allows measurement modalities from the world of force microscopy, such as non-contact atomic force (NC-AFM) and Kelvin probe force microscopy (KPFM), to be performed 'alongside' STM and STM spectroscopy with a metal tip or a metal tip functionalized with a well defined probe species such as CO or Xe. This approach is illustrated using two different systems. The near surface defects in the delta-doped B:Si(111) system have been studied using a combination of STM, KPFM, total energy DFT and STM theoretical simulations. This allowed defect configurations to be identified and the chemical activity of commonly found configurations to be compared. Also, it has previously been found that the large dipole moment of Ir(ppy)₃ results in a repulsive dipole-dipole interaction in addition to the long-range interaction mediated by the Shockley surface states when it is adsorbed on Cu(111). These interactions lead to a model system with highly dispersed superstructures. The conformations of this large dipolar molecule on Cu(111) have been identified with STM, DFT total energy and STM simulation. In addition to these two studies, new experimental facilities will be described that will allow combined STM/AFM to be performed at Queen's University with a qPlus sensor for the first time.

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