Modeling the Influence of Flow and Mass Transport during in Situ AFM Measurements of Solution Crystal Growth

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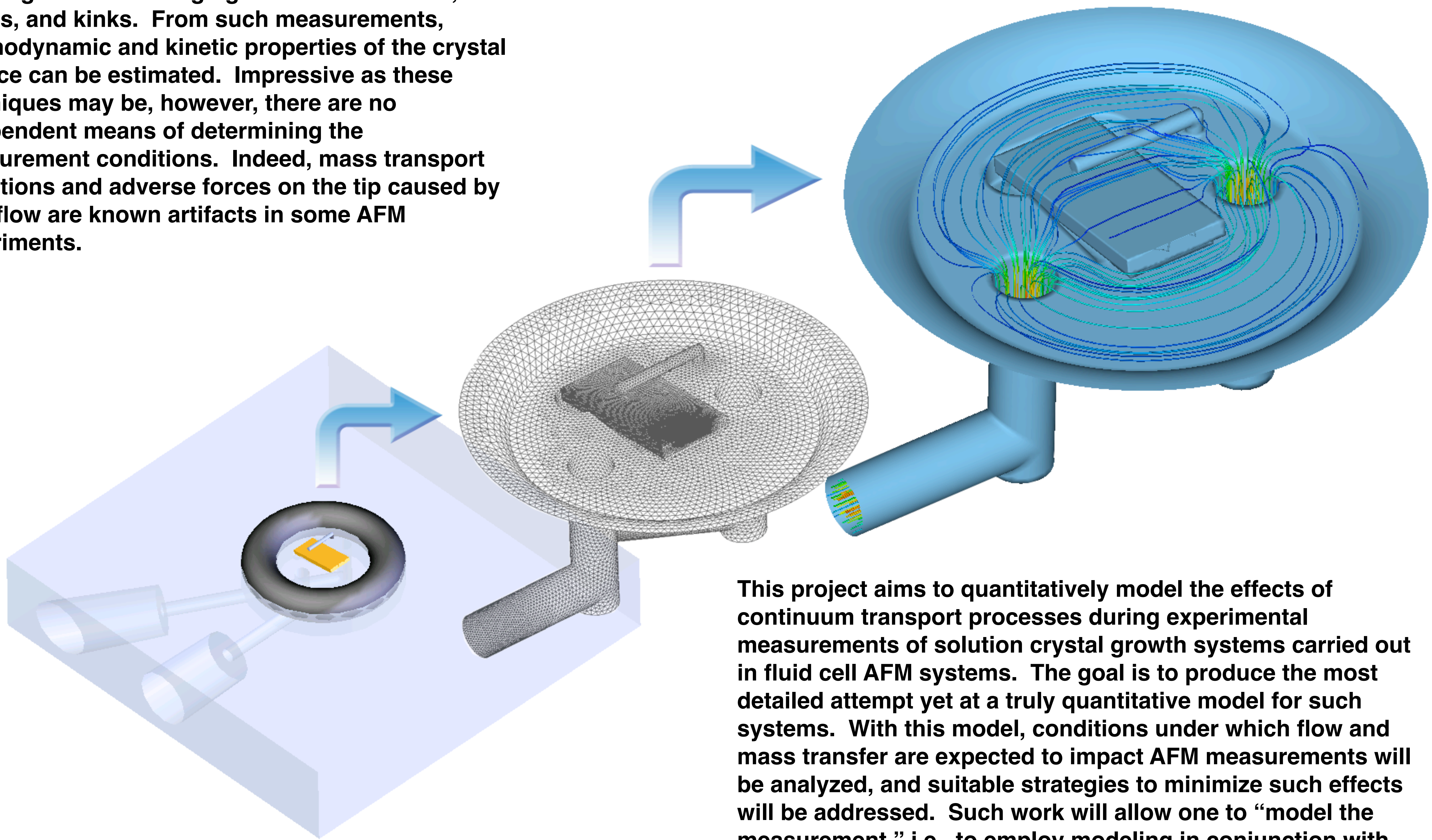
Atomic force microscopy (AFM) has become one of the preeminent experimental tool for in situ and real-time measurements of solution crystal growth, enabling the direct imaging of surface terraces, ledges, and kinks. From such measurements, thermodynamic and kinetic properties of the crystal surface can be estimated. Impressive as these techniques may be, however, there are no independent means of determining the measurement conditions. Indeed, mass transport limitations and adverse forces on the tip caused by fluid flow are known artifacts in some AFM experiments.



This project aims to quantitatively model the effects of continuum transport processes during experimental measurements of solution crystal growth systems carried out in fluid cell AFM systems. The goal is to produce the most detailed attempt yet at a truly quantitative model for such systems. With this model, conditions under which flow and mass transfer are expected to impact AFM measurements will be analyzed, and suitable strategies to minimize such effects will be addressed. Such work will allow one to "model the measurement," i.e., to employ modeling in conjunction with AFM experiments to obtain accurate interpretations of measurement data.