Vapor Phase Surface Functionalization using Atomic Layer Deposition (ALD) and Self Assembled Monolayers (SAMs)

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The growing adoption of Atomic Layer Deposition (ALD), as a means of producing highly uniform, and conformal thin films, has paved the way for its use in an array of extremely important emergent technologies. Within this class of self-limiting deposition techniques, Self Assembled Monolayers (SAMs) are gaining visibility as a means of functionalizing surfaces. The ability to use both SAMs and ALD together has enabled some unique applications, and presents an opportunity to study the intersection of these two thin film methods. In this work, an overview of SAMs, and ALD deposition work will be presented, along with results of in-situ analysis of the growth of ALD films on the SAMs surfaces. Additionally surface functionalization results using the hybrid ALD/SAMs combination will be explored along with prospective applications.

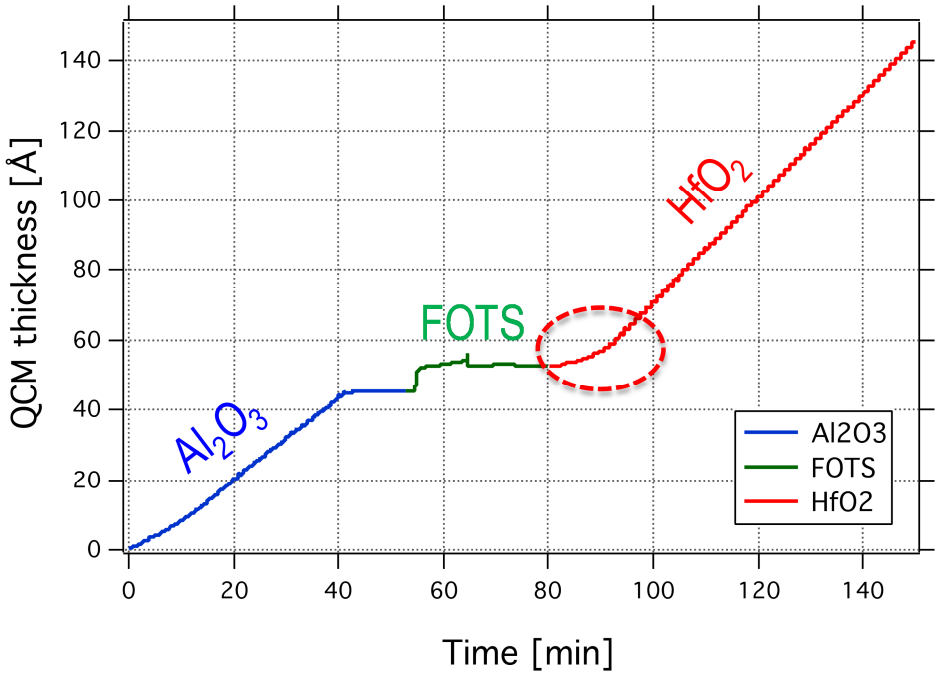

Figure 1. QCM (Quartz Crystal Microbalance) trace detailing the growth of ALD Al_2O_3, on a Si substrate, followed by FOTS (Fluorinated Trichlorosilane) SAMs coating, terminated by and ALD coating of HfO_2. The circled region of the in-situ QCM data depicts in realtime, the nucleation delay experienced by the growth of ALD HfO_2 on the SAMs functionalized surface.