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Fundamental Data for Semiconductor Manufacturing Unit Process Modeling and Simulation: Generation, Application and Current Needs

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The aim of semiconductor device modeling and simulation of unit process integration is to predict the impact of process integrations on how material properties and topographies evolve as devices are being manufactured. The complexity of most semiconductor manufacturing processes, notably plasma processes, means that simulations of these processes relies heavily on the availability of comprehensive plasma, atomic and molecular physics, and surface physics data. More often than not, this data has not existed, has been difficult to measure experimentally or has been expensive to compute. The pace of process development ($\sim$18 months per technology generation) has made filling data gaps challenging. A program for the generation of electron impact cross-sections, heavy particle collision process rates and surface interaction properties has been developed at Freescale Semiconductor Inc. to fill the needs of a comprehensive unit process integration simulation effort. The life-cycle of data generation through application will be described in this presentation highlighting areas of general need for future technology nodes.