Modeling of Chemical Mechanical Polishing for Chip Manufacturing

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Fabrication of semiconductor devices consists of many process steps. Thin films deposition, lithography for printing patterns, plasma etch for etching patterns in order to make interconnects and shallow trenches for transistors isolation, and Chemical Mechanical Polishing (CMP) for surface planarization for the next layer construction can be regarded as key processes used for chip manufacturing. Chip manufacturers shrink transistors sizes and spaces between them continuously to gain more functionality per unit area. With the scaling down of process technology nodes, planarity variations of just a few nanometers can have a significant impact on manufacturing success. Used to improve wafer planarity, chemical-mechanical polishing (CMP) has been a key component of chip manufacturing for more than two decades.

Currently, many manufactures use CMP modeling for hotspots or "week points" detection as part of their design for manufacturing (DFM) flow. Generation of high quality CMP models and post-deposition surface profiles for polishing are crucial for CMP modeling due to complex nature of the process and long range effects in CMP.

In my talk I will overview the CMP process and discuss CMP modeling approaches. I will also present our recent works on the application of Machine Learning and Neural Networks to generation of surface profiles of advanced deposition processes for CMP modeling.

Author's short biography:

Ruben Ghulghazaryan is a lead R&D engineer in the Design to Silicon Division at Mentor, A Siemens Business. He has extensive experience in both theoretical and applied physics research, with more than 30 industry and academic publications. He received his M.Sc. in theoretical physics and biophysics at Yerevan State University, Armenia at 1997. In 2000 he got his Ph.D. in physics from Yerevan Physics Institute (YerPhI), Armenia. From 2000 to 2006 he was awarded Junior Associate position at ICTP, Italy. From 2004-2005 he was Post-Doctoral Research Fellow at Institute of Physics, Academia Sinica, Taiwan. In 2006 Ruben jointed Ponte Solutions startup in Armenia as physicist researcher. In 2008 Ponte Solutions was acquired by Mentor Graphics.