

Materials Science & Engineering Colloquium

Present and Future BEOL Integration Challenges



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The integration of conductors and insulators for advanced ICs is a fascinating and wide ranging subject. At the beginning of the IC revolution device speed was the major limitation and interconnect did not receive much attention. However, this has certainly not been the case over the last decade; several years ago Cu metal replaced Al to improve resistance, and since then the industry has been struggling to reduce the capacitance around the metal with the introduction of new dielectric materials. Today materials challenges exist in both the insulator (dielectric) and the conductor (Cu). Building a multi-level interconnect structure that delivers increasing performance at the same time as meeting conflicting (but also increasing) reliability standards requires major development manpower and resources. This presentation will outline the major challenges that exist and the options under investigation to overcome them.

At the same time, the semiconductor industry is becoming quite mature. Technological superiority is no longer enough; time to market and cost are critical factors. The cost to develop a new technology node is becoming so high that Companies who were traditionally competitors are banding together in consortia to spread the load. The costs of new Fabrication plants are also extremely high, and many OEMs are choosing the use the foundry model. Both factors tend to reduce the number of new Fabs buying processing tools, so tool suppliers are diverging into associated industries, like solar panels. Development engineers trained with Semiconductors in mind should be prepared for this changing environment.

Rod Augur obtained his B.SC. in Physics from Imperial College London, and his Ph.D. in Electrical Engineering from Cambridge University, England. Beginning in 1988, he worked at Philips Research Labs. in The Netherlands on reliability of Al metallization. It was there that he become interested in BEOL interconnect integration. In 1995 Dr. Augur moved to the U.S.A to work for Philips Semiconductors, developing a Hot-Al/CVD-W BEOL for state of the art (at the time) BiCMOS ICs. In 1998 took an assignment for Philips at International Sematech to work in the I300I 300mm tool evaluation/selection initiative, and 1 year later entered the Interconnect Thrust to work on Cu/low-k integration. During his assignment he was the BEOL integration manager, and the team first published results from a multi-layer integration of Cu with a porous low-k dielectric. Since 2003 Dr Augur has worked for Advanced Micro Devices, and he is currently their BEOL integration manager at the consortium with IBM in East Fishkill. He is also one of AMD's SRC TAB members for IPS. R.A. Augur has published many papers on metal reliability and integration in International Conferences and Journals.