

CONCLUDING REMARKS BY PAUL LANGER

I would like to make a very brief summary. We have heard 22 papers and some last minute remarks in the last couple of days and I think it points up the direction that spreading resistance measurements will probably go in the next few years. There are two areas that will probably get the bulk of the development effort. The first area is probably the development of more reliable correction factors for all types of structures specifically very thin transition regions between either one type or the same type of dopant. I think there is also a need not only to have very complex correction factor models but also a need for fast and simple correction factor models so that one will be able to perform these calculations on a calculator or a mini computer. The second area is that of surface preparation and it is still a big unknown. Most laboratories have standardized more or less on their own type of sample preparation. Under those constraints good intralab precision has been obtained but this high level of precision may degrade in interlab studies due to differences in specimen preparation. So I think surface preparation will get some closer looks over the next few years. On the positive side, it is very nice to see the wide acceptance that spreading resistance has had in all areas of the semiconductor industry. Crystal growers are using it, the people in epi and diffusion are using it, and people modeling devices are using it. Spreading resistance seems to have come of age. It probably does not really have as far to go as one would think from listening to some of the discussions.

I would like to reemphasize the role of ASTM and NBS in the measurements area. The American Society for Testing and Materials is your organization as is the Bureau of Standards. These organizations are here to do the work that people in the semiconductor industry are interested in getting done. The Bureau of Standards does not go off on research projects for the sake of research alone as neither does ASTM. It gets its inputs from the industry and if you have a specific project you think really needs to be pursued or if you would like to help out in pursuing some of the work being done on electrical measurements or other means of characterization I suggest you attend the next meeting in Scottsdale. It is right after Labor Day and I think it will be very beneficial since in obtaining intercompany standardization one really needs to exchange material based on spreading resistance measurements. Finally I would just again like to thank the members of the committee who acted as session chairmen, Ken Benson and Bernie Morris of Bell Labs, Fred Mayer of RCA, Francois Padovani of T. I. and Fritz Vieweg-Gutberlet of Wacker Chemitronic; and also to our arrangements man, Jim Ehrstein from the Bureau of Standards. Thank you all for coming and hope to see you all again soon.