Observing early stages of growth and scaling graphene over 300mm wafers

Kenneth Teo*, Andy Newham, Matthew Cole, Nalin Rupesinghe
AIXTRON, Cambridge, United Kingdom

Kemal Celebi, Jong Won Choi, Hyung Gyu Park
ETH Zurich, Zurich, Switzerland

*Presenting author: k.teo@aixtron.com

Here, we present our observations made during the early stages of graphene growth employing a chemical vapour deposition method with copper catalyst. Spectroscopic monitoring of surface catalysis showed that graphene crystals evolve from densely distributed nucleation points that interconnect to form large crystals covering the entire surface. Under certain conditions, secondary nucleation which form a second layer was observed inside the primary graphene crystals. Kinetics of growth and effective activation energy for the graphene synthesis will be discussed for a possible rate limiting step of the surface catalytic synthesis of graphene. Conditions for large-scale synthesis of monolayer graphene will be addressed in this talk. Growth and characterisation of graphene grown using copper films on silicon dioxide on silicon substrates were performed. Key considerations for scaling are discussed and graphene growth on the 300mm wafer scale was demonstrated.

Figures

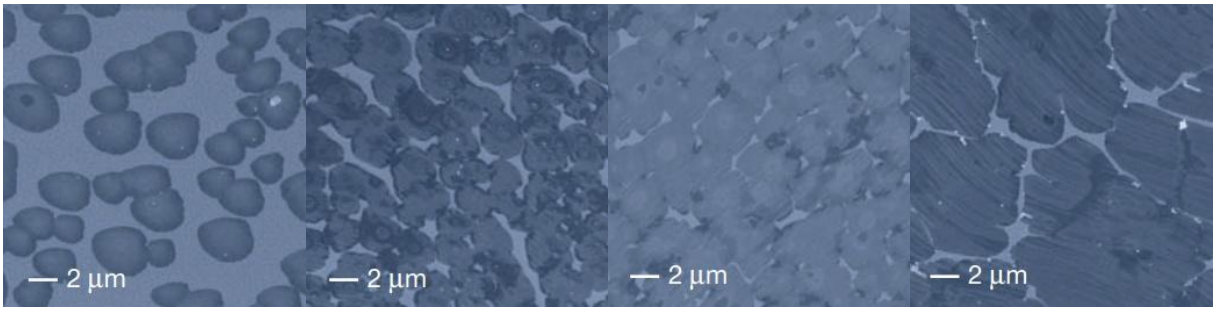

Figure 1: Evolution of graphene domains during growth

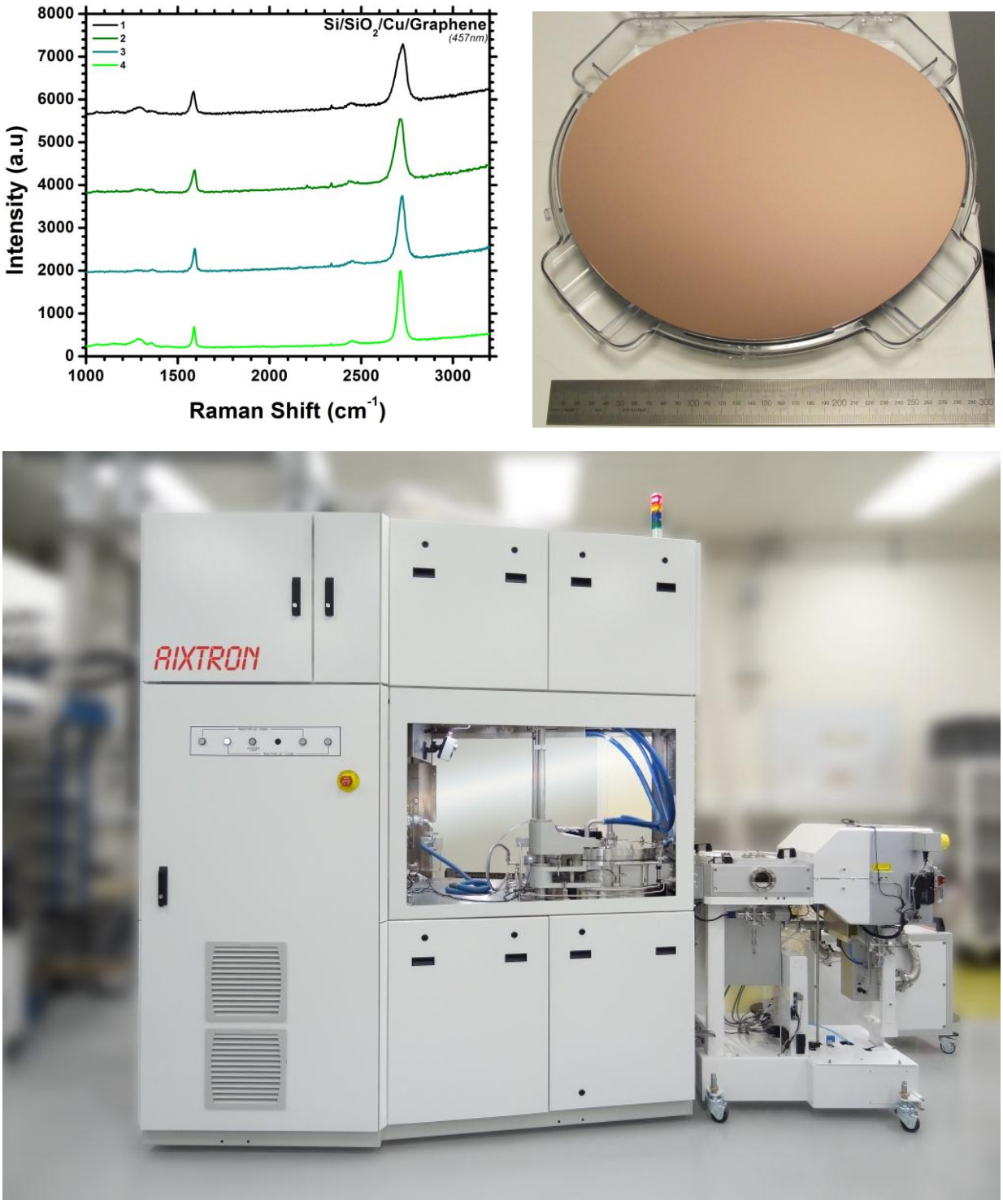

Figure 2: Growth of graphene onto Cu/SiO2/Si wafers. Clockwise from top left: Raman spectroscopy, 300mm wafer, AIXTRON BM 300 automated equipment