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**A MATHEMATICAL MODEL OF THE SILICON CHEMICAL VAPOR DEPOSITION IN A  
ATMOSPHERIC PRESSURE COLD-WALL REACTOR**

Y.J. PARK, G.J. MIN, Y.W. PARK, C.O. PARK\* and J.S. CHUN

*Department of Materials Science and Engineering Korea Advanced  
Institute of Science and Technology, PO Box 131, Cheongryang, Seoul,  
Korea*

*\*Department of Electronic Material Engineering Korea Institute of  
Technology, 400, Kusung-dong, Su-gu, Taejon, 302-338, Korea*

Abstract - The deposition of polycrystalline and amorphous silicon from  $\text{SiH}_4\text{-H}_2$  and  $\text{SiH}_4\text{-CH}_4\text{-H}_2$  system has been studied. Deposition temperature between 600 and 850°C have been used in a atmospheric pressure reactor. It is found that the deposition rate of silicon in  $\text{SiH}_4\text{-CH}_4\text{-H}_2$  system is reduced by about half  $\text{SiH}_4\text{-H}_2$  system. Therefore, to investigate the effect of  $\text{CH}_4$  in silicon deposition we describe numerical models of the gas-phase hydrodynamics and chemical kinetics. The chemical kinetic model, which includes a 16-step elementary reaction mechanism in  $\text{SiH}_4\text{-H}_2$  system and a 32-step in  $\text{SiH}_4\text{-CH}_4\text{-H}_2$  system for the thermal decomposition of silane, predicts chemical species concentration profiles and fluid dynamical simulation predicts gas-phase temperature and velocity profiles. The chemical kinetic calculations indicate significant differences in the levels of silicon species for  $\text{SiH}_4\text{-H}_2$  system versus  $\text{SiH}_4\text{-CH}_4\text{-H}_2$  system and decomposition of  $\text{SiH}_2$  is important in describing silicon chemical vapor deposition.