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Magnetic Field-Assisted, Nickel-Induced Crystallization of Amorphous Silicon Thin Film

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For high-performance TFT (Thin film transistor), poly-crystalline semiconductor thin film with low resistivity and high hall carrier mobility is necessary. But, conventional SPC (Solid phase crystallization) process has disadvantages in fabrication such as long annealing time in high temperature or using very expensive Excimer laser. On the contrary, MIC (Metal-induced crystallization) process enables semiconductor thin film crystallization at lower temperature in short annealing time. But, it has been known that the poly-crystalline semiconductor thin film fabricated by MIC methods, has low hall mobility due to the residual metals after crystallization process. In this study, Ni metal was shallow implanted using PIII&D (Plasma Immersion Ion Implantation & Deposition) technique instead of depositing Ni layer to reduce the Ni contamination after annealing. In addition, the effect of external magnetic field during annealing was studied to enhance the amorphous silicon thin film crystallization process. Various thin film analytical techniques such as XRD (X-Ray Diffraction), Raman spectroscopy, and XPS (X-ray Photoelectron Spectroscopy), Hall mobility measurement system were used to investigate the structure and composition of silicon thin film samples.

Keywords: MIC (Metal-induced crystallization), Polycrystalline silicon thin film, PIII&D, Magnetic field