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Abstract
In this thesis, Nickel Induced Lateral Crystallization (MILC) method was employed to crystallize α -Si films for low temperature Poly-Si (LTPS) application. The crystallization rate of metal induced lateral crystallization is generally low with a typical crystallization rate of 2μm/hr. In order to increase crystallization speed, the study accelerated lateral crystallization is accelerated by electrical field. The electrical field is applied by applying voltages striped Ni electrodes during thermal annealing. The degree of crystallization dependent on annealing time, annealing temperature, annealing ambient, a-Si films deposition temperature, and electrical field are investigated. The fabrication of TFT with poly-Si is attempted.
The results show the samples which were annealed in high vacuum ambient have better crystallinity of poly-Si. On the other hand, the samples annealed in atmosphere and O2 can not induce the crystallization of a-Si. The a-Si films were deposited by RF sputter with different heating temperature, and the MILC polysilicon was found to have better crystallization when the a-Si layer was deposited at a lower deposition temperature.
The results of electric field aided lateral crystallization show that the lateral growth rate of poly-Si is about 1.5μm/hr when the samples were annealed at 600℃ for 4hr with the electrical field E = 0 V/mm. The growth rate increases to about 1.5~2.5 μm/hr when annealed at 600℃ for 4 hr with E = 25, 50, 100V/mm, the electrical field do not enhance the growth rate of poly-Si clearly. For the samples annealed with E = 200, 400 V/mm, the growth rate can be enhanced to 5 and 7.5 μm/hr, respectively. This observation implies that film stress may be the dominating factor and prohibit the crystallization when E < 100 V/mm. Whereas E >100 V/mm, the electrical field appears to become effective and can speed up the growth rate of poly-Si.
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