Poly-Si TFTs with One-dimensionally Long Silicon Crystal Grains Using DLB Continuous-wave Laser Lateral Crystallization

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Low-temperature Poly-Si (LTPS) TFTs with large crystal grains have been developed for high current dravability. As size of the crystal grains become larger, variation of the device characteristics also become larger. For the variation reduction, control of crystal orientation is key issue. In this work, poly-Si thin films with large one-dimensionally long silicon crystal grains were fabricated by continuous-wave laser lateral crystallization with double-line laser beam (DLB-CLC). The silicon grains had crystal orientation of {110}, {111} and {211} in the laser lateral crystallized plane, the transverse side plane and the surface plane, respectively. Figure 1 shows EBSD mapping of crystalinity of the aser lateral crystallized plane. All the silicon grains were elongated in the laser-scanning direction and linearly arranged with a length of over 100 μm and a width of 0.7 μm.

Poly-Si TFTs with the well-crystal oriented poly-Si thin films were fabricated at low temperature (≦550 °C) with a metal gate self-aligned process.. Fugure 2 shows the I_D-V_G characteristics of the fabricated TFTs. High field-effect mobility of 560 cm^2/Vs was achieved, and its variation was within 10% at same crystallization region. This technology is applicable for next generation of FPDs and also novel applications.

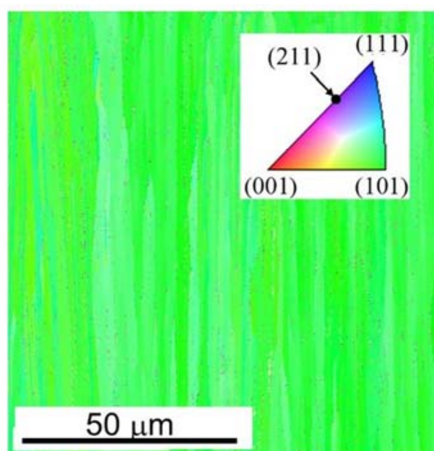

Fig.1 EBSP mapping of the laser-crystallized poly-Si thin films : crystallinity of laser-lateral crystallized plane[1].

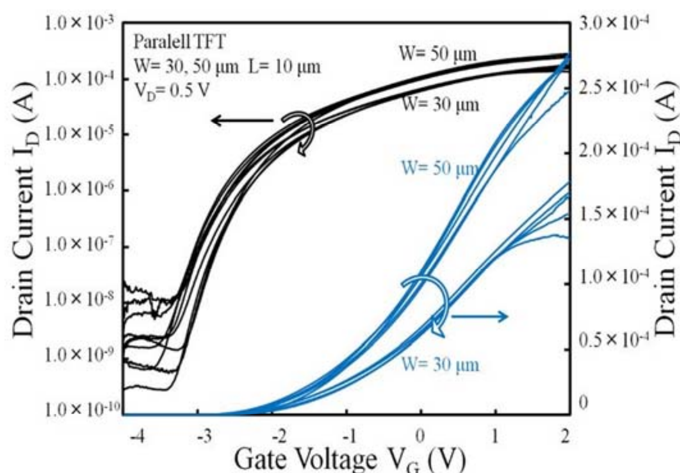

Fig.2 I_D-V_G characteristics of the laser-crystallized poly-Si TFTs with DLB-CLC.

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