INVESTIGATION OF ELECTRON FIELD EMISSION FROM POLYCRYSTALLINE SILICON FILMS

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Electron field emission from polycrystalline silicon films is investigated. The polycrystalline silicon was deposited by LP CVD. Polysilicon layers were in situ and diffusion doped with $POCl_3$ at 900 and 950 ° for 30 min. A sharpening of asperities on the polysilicon layer surface was performed by thermal oxidation in dry O_2 or H_2O at various temperatures in the range 900 ‒ 1100 ℃. After oxidation and removing of the oxide, the surface of polycrystalline silicon has developed asperities, especially in the case of oxidation at lower temperature. The asperities on polysilicon surfaces have special irregularities, i.e., different sizes (height-base ratio) and shapes. The surface morphology is estimated by scanning electron microscope (SEM). The measurement of emission current from samples was performed in the high vacuum system, which could be pumped to a stable pressure of 10^{-6} Torr. The emission areas and local field enhancement factors are determined and used to establish a relationship among current-voltage curves for polycrystalline silicon with different surface morphology. Polycrystalline silicon layers are characterized by relatively high emission current, which is connected with a large emission area.