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Combinatorial deposition of microcrystalline Si films using multi-hollow discharge plasma CVD TAKEAKI MATSUNAGA, YUKI KAWASHIMA, KAZUNORI KOGA, WILLIAM MAKOTO NAKAMURA, KENTA NAKAHARA, HIDEFUMI MATSUZAKI, DAISUKE YAMASHITA, GIICHIRO UCHIDA, KUNIHIRO KAMATAKI, NAHO ITAGAKI, MASAHARU SHIRATANI
— Recently, we have developed a multi-hollow discharge plasma CVD method by which fluxes of H and SiH_3 radicals and their flux ratio on a substrate can be varied with a distance z from the discharge region. In this study, we deposited Si films with different structures n a combinatorial way and evaluated z dependence of the film crystallinity by laser Raman spectroscopy. Films were deposited using the multi-hollow discharges of H_2+SiH_4 (0.33%) for a gas pressure P Spatial profile of the deposition rate and the crystallinity significantly depend on z For P= 2 Torr, no films are deposited just near the discharges due to Si etching by H, μc-Si films are deposited for z= 3 - 32 mm. For P=6 Torr, μc-Si films are deposited in a narrow region for z= 0 - 7 mm. These results indicate that the spatial profile of the flux ratio of H to SiH_3 strongly depends on the gas pressure and a process window of microcrystalline Si films becomes quite narrow at a higher gas pressure

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