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Influence of RF plasma power on structural properties of AlN thin layers grown by PAMBE on Si (111)¹ MAHESH PANDIKUNTA, OLEG LEDYAEV, SERGEY NIKISHIN, Department of ECE and Nano Tech Center at COE — AlN grown by plasma assisted molecular beam epitaxy (PAMBE) is attractive for fabrication of high-power and high-frequency electronic devices. The Si substrate is used for deposition of AlN due to its low cost, high thermal conductivity, and compatibility with existing Si technologies. The growth of AlN layers with desirable Al- or N-face polarity on Si (111) is still a challenge for researchers. In this work, the influence of RF plasma power on initial nucleation and subsequent growth of AlN layers on Si (111) substrate by PAMBE was studied. Six AlN samples were grown at RF power in the range of 150-450 W when the N₂ flow rate was set to 0.6 sccm. The surface reconstruction was controlled in situ by reflection high energy electron diffraction (RHEED). The RHEED pattern was 1 x 1 for AlN grown at RF power of 300-450 W, while the samples grown at lower RF power had 3 x 6 reconstruction related to N-face polarity. We found that crystalline quality of AlN strongly depends on the RF power. The screw and edge dislocation densities for the best AlN sample grown at 150 W were estimated to be 1.4E9 and 5.9E9 cm⁻², respectively.

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