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Meter-Scale Microwave Plasma Production and its Application to Silicon Thin Film Deposition HIROTAKA TOYODA, YUDAI TAKANISHI, HIROTAKA ENDO, TATSUO ISHIJIMA, Nagoya UNiversity — There has been a great need for meter-scale plasma sources for giant materials processing, such as thin film transistor manufacturing for meter-size liquid crystal display (LCD), deposition of silicon thin films for photovoltaic power generation and so on. Recently, we have developed a new technology for production of surface wave excitation [1]. In this paper, we demonstrate production of meter-scale large-area plasma with multiple waveguide lines. In the experiment, microwave power (<30 kW) is coupled to the plasma through power divider, multiple waveguide lines and slot antennas. Optical and Langmuir probe measurements of Ar/H₂ plasma show production of very uniform plasma at a plasma density of $3.4 \times 10^{11} \text{ cm}^{-3}$ and a variance of 2% within an area of 0.9 m x 0.9 m. With use of carefully-designed gas manifold, microcrystalline silicon films are deposited on sample substrates. Deposition rate of ~ 0.3 nm/s with a variance of less than 10 % is obtained within an area of 0.6 m x 0.7 m. Uniformity of film quality such as film crystallinity is also confirmed. [1] H. Sugai, Y. Nojiri, T. Ishijima and H. Toyoda, 6th Int. Conf. on Reactive Plasmas and 23rd Symp. on Plasma Processing, (Matsushima, 2006), p.17.

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