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Control Capabilities of Reactive Sputter Deposition Process via ICPs Driven by Low-Inductance Antenna for Large-Area Formation of Thin Film Devices YUICHI SETSUHARA, KOSUKE TAKENAKA, Joining and Welding Research Institute, Osaka University, AKINORI EBE, EMD Corporation — Novel plasma-enhanced reactive sputter-deposition system has been developed with a new type of low-inductance antenna (inner-type LIA) consisting of an RF antenna conductor with a length much shorter than the RF wavelength, which is embedded in a hall region dug in the chamber wall and the dielectric window plate for insulation. This new type of the reactive sputter-deposition system has been developed for enhancement of sputter discharge and excellent control of reactivity during film growth. The ICP-enhanced sputter system has been applied to film formations of micro-crystalline silicon (intrinsic layer) and transparent amorphous oxide semiconductor, a-InGaZnO4 (a-IGZO), aiming at low-temperature formation of high-quality functional films for development of next-generation flexible devices. The newly developed process can offer independent control of the flux ratio of the reactive species (ions and radicals) to the deposited species sputtered out of the target. With this new method, micro-crystalline silicon films with crystallinity of 74% and a-IGZO films with mobility as high as 18 $cm^2(Vs)^{-1}$ have been successfully formed without substrate heating. Furthermore, for development of large-area deposition, uniformity control capabilities with a linear rectangular sputter target with 500 mm length have been examined via variation of power deposition profiles with multiple LIAs.

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