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Energy distribution function on high power impulse magnetron sputtering[1] MASAYUKI NAKAMURA, KEIGO TAKEDA, Meijo University, AKINORI ODA, Chiba Institute of Technology, HIROYUKI KOUSAKA, Gifu University, TAKAYUKI OHTA, Meijo University — High power impulse magnetron sputtering (HiPIMS) is the pulse sputtering to produce the high energy ions. A pulsed high voltage of several tens μs is applied to the target at a frequency as low as several hundred Hz. The peak power density is 100 times larger than that of dcMS under same average power density, so that an ionization of sputtered species is promoted and the production of high energy ions is realized. Sputtered ion and gas ion produced in the plasma are incident on the film and influence the crystal structure of the film. Therefore, it is essential to analyze and control their energy and ion-to-neutral flux ratio. In this study, we measured ion energy distribution function (IEDF) by energy-resolved mass spectrometry. In the case of C-HiPIMS, the IEDF of Ar ion composed of bi-Maxwell velocity distribution function with low and high temperatures. On the other hand, that of C ion was composed of Maxwell velocity distribution function with high temperature. In the case of reactive TiN-HiPIMS, the energy tail of N ion extends toward 80 eV as well as Ti ion with increasing input voltage. These differences would be explained by the production process ions in HiPIMS.

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