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Fabrication of spin valve junctions based on $Fe/Fe_3Si/FeSi_2/Fe_3Si$ quadrilayered films by facing targets direct-current sputtering[1] KAZUYA ISHIBASHI, KAZUTOSHI NAKASHIMA, Department of Applied Science for Electronics and Materials, Kyushu University, KEN-ICHIRO SAKAI, Department of Control and Information Systems Engineering, Kurume National College of Technology, TSUYOSHI YOSHITAKE, Department of Applied Science for Electronics and Materials, Kyushu University — In order to prepare magnetic multilayered films applicable to spin devices, the film preparation method is an important key that determines the quality of the spin devices, such as interfaces between layers and crystalline orientations. A facing targets direct-current sputtering (FTDCS) method, in which a couple of targets are positioned in parallel and a substrate is set in the direction perpendicular to the two targets, has the following features: (i) less plasma damage, (ii) fewer rises in the substrate temperature, and (iii) small stoichiometric differences between the target and film, owing to a substrate is free of the plasma. These features should be beneficial to $Fe_3Si/FeSi_2$ multilayered films at low substrate temperatures, with Fe_3Si and $FeSi_2$ sintered targets. In this study, $Fe/Fe_3Si/FeSi_2/Fe_3Si$ multilayered films were prepared by employing the FTDCS method. The bottom Fe_3Si layers were epitaxially grown on Si(111) substrates, and they exhibited small coercive forces of less than 10 Oe. Posterior to $FeSi_2$ layers being deposited on the bottom Fe_3Si layers, polycrystalline Fe_3Si and Fe were successively deposited on the $FeSi_2$ layers. The resultant multilayered films showed sharp signals due to magnetoresistance as spin valves.

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