Magnetic properties of Fe/FeSi$_2$/Fe$_3$Si trilayered films prepared by facing targets sputtering deposition$^1$ 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 — Whereas giant magnetoresistance and tunnel magnetoresistance films generally employ nonmagnetic metal and insulator spacers, respectively, we have studied Fe$_3$Si/FeSi artificial lattices, in which FeSi$_2$ is semiconducting and its employment as spacers is specific to our research. For the formation of parallel/antiparallel alignments of layer magnetizations, the employment of ferromagnetic layers with different coercive forces is required. There have been few studies on the fabrication of Fe-Si system spin valves comprising ferromagnetic layers with different coercive forces. In this work, Fe$_3$Si and Fe were employed as ferromagnetic layer materials with different coercive forces. Fe/FeSi$_2$/Fe$_3$Si trilayered spin valve junctions by facing targets direct-current sputtering deposition combined with a mask method, and their electrical and magnetic properties were studied. An Fe$_3$Si layer was epitaxially grown on Si(111) substrate as a bottom layer. After that, an Fe layer with a large coercive force was deposited as a top layer, posterior to a FeSi$_2$ layer being deposited. From magnetization curves measured by a vibrating sample magnetometer, it was confirmed that the parallel and antiparallel magnetization alignments of ferromagnetic layers are clearly realized.

$^1$This work was supported by JSPS KAKENHI Grant Number 15K21594.