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Formation of nanopatterned metal/oxide/metal multilayered structures using anodization process

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In this studies we present a new approach to preparation of a nanopatterned metal/metal-oxide/metal (M/M-O/M) junctions using the anodization method. The junctions are composed of a 3d transition metals (i.e. Ti, Fe) and their oxides. The patterning is performed with especially designed anodization process. First an aluminum prepatterned templates are prepared, where after removing anodized aluminum oxide (AAO), a bowl-like U-shape structures remain. Next titanium or iron thin layer is deposited on anodized aluminum substrate and then metallic layer is shortly anodized to create thin layer of TiO_x or FeO_x oxide. The thickness of oxide layer can be controlled by choosing appropriate time of anodization. Furthermore, to enhance crystallization process of the oxide layer an annealing in vacuum or O_2 rich atmosphere at high temperatures is performed. Finally the formation of the M/M-O/M junction is completed with deposition of Ti or Fe metallic layer.

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