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Comparative Study on Mechanical Properties of MoSiN Multilayer Films Deposited on Si(100) and Ti-covered Si(100) Substrates

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We have deposited Mo-Si-N multiplayer films on both pure Si(100) and Ti-covered Si(100) substrates using $MoSi_2$ target by pulsed D.C. and/or RF magnetron sputtering method. For a fabricating of the Ti-covered Si(100) substrate, we also grown Ti layers with thickness of 200 and 500 nm using a Ti target by RF magnetron sputtering method. In order to elevate hardness and stress properties of the as-grown Mo-Si-N thin films, argon and nitrogen plasma ignited by radio-frequency (RF) and pulsed D.C under vacuum condition was also used in a mixture of argon and nitrogen at a total pressure $p_T = p_{Ar} + p_{N2} = 0.7$ Pa, low substrate bias $U_s = -100$ V and high substrate ion current density is=1.5 mA/cm^2. Under these conditions, the Mo-Si-N films with approximately 3 μm thick were obtained. The as-grown Mo-Si-N films were also investigated using x-ray diffraction (XRD), x-ray photoelectron spectroscopy (XPS), Hardness (Gpa), and macrostress (σ) for analysis of relationship between film composition and microstructures.