Reactive Sputter Deposition of Titanium Nitride on Silicon Using a Magnetized Sheet Plasma Source

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Abstract : Titanium nitrite (TiN) a popular functional and decorative coating because of its golden yellow color, high hardness and superior wear resistance. It is also being studied as a diffusion barrier in integrated circuits due to its known chemical stability and low resistivity. While there have been numerous deposition methods done for TiN, most required the heating of substrates at high temperatures. In this work, TiN films are deposited on silicon (111) and (100) substrates without substrate heating using a patented magnetized sheet plasma source. Films were successfully deposited without substrate heating at various target bias, while maintaining a constant 25% N2 to Ar ratio, and deposition of time of 30 minutes. The resulting films exhibited a golden yellow color which is characteristic of TiN. X-ray diffraction patterns show the formation of TiN predominantly oriented in the (111) direction regardless of substrate used. EDX data also confirms the 1:1 stoichiometry of titanium an nitrogen. Ellipsometry measurements estimate the thickness to range from 28 nm to 33 nm. SEM images were also taken to observe the morphology of the film.

Keywords : coatings, nitrides, coatings, reactive magnetron sputtering, thin films
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