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Epitaxial Ni/VO_2 heterostructures on Si (001) SRINIVASA RAO SINGAMANENI, GABRIELLE FOLEY, JOHN PRATER, JAY NARAYAN, North Carolina State University — VO_2 is a strongly correlated oxide, undergoes a first order metal-insulator (MIT) well above the room temperature 340K. Previous works have shown that the stress associated with structural changes across MIT, VO_2 can produce significant changes in magnetic properties of over layer ferromagnetic films such as Ni. This control of the magnetic properties could be very important to many technological applications. However, the current use of r-sapphire as substrate can be restrictive in the microelectronics industry. The previous works focused their studies on polycrystalline Ni and VO_2 films, which do not allow the precise controlling of the associated properties due to poor reproducibility of polycrystalline films. We have investigated the magnetic and electronic properties of Ni/VO_2 films when epitaxially integrated on Si (001) by pulsed laser deposition using domain matching epitaxy paradigm. Ni was grown both in nanoscale islands and layered form. The XRD results showed that the Ni, VO_2 and YSZ layers were grown epitaxially in single out of plane orientations. We found that the hysteresis in resistance vs. temperature curves in VO_2 thin films was retained even when it is in close proximity with the Ni layer which helped confirm that VO_2 layer preserves its characteristic features, revealed the fingerprint magnetic features of Ni layer. We will present and discuss our comprehensive experimental findings.

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