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Photoconductivities of Nanocrystalline Vanadium Pentoxide Thin Film Grown by Plasma Rf Magnetron Sputtering at the Different Condition of Deposition

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In this study, the fabrication and characterization of a metal–semiconductor–metal (MSM) visible photodetector based on V_2O_5 were investigated. The V_2O_5 thin film was synthesized on n-type Si (100) as substrate by plasma RF-sputtering. The photoconductivity of the nanocrystalline vanadium pentoxide (V_2O_5|Si) was investigated at the different conditions of deposition (i.e. RF-sputtering power, pressure, and substrate temperature). The photoconductivity measurement of this work was performed in the darkness and under illumination, with applied voltage from a range of 0.1−10 V and illumination intensity 9.8 mW/cm^2. I−V characteristics under illumination showed that the films prepared from V_2O_5 on the basis of *n*-Si have good efficiency and the best is at power 150 W, pressure 0.03 Torr, and temperature 473 K. The fabricated photoconductive detector showed the spectral response (R_λ) value of 0.0783 AW^{-1}, quantum efficiency 18.04%, spectral detectivity $D^* = 6.984 \cdot 10^9$ cm $\cdot$ Hz$^{1/2} \cdot$ W^{-1} at wavelength 600 nm, and low spectral responsivity in the UV region.

Keywords: vanadium pentoxide, photoconductivity, physical vapour deposition, plasma RF-sputtering.