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Transparent conducting films of sputtered tantalum oxide for solar cell window layers MARK STOCKETT, JOHN SCOFIELD, Oberlin College — Tantalum Oxide (Ta_2O_5) is commonly used in capacitors for its high dielectric constant and is highly insulating with resistivity on the order of 10^8 ohm m. Ta₂O₅ is however a semiconductor with a bandgap of 4.2 eV and could be made to conduct if appropriately doped. These films may have useful applications as a window layer for thin film heterojunction solar cells. Transparent films of amorphous tantalum oxide (Ta_2O_5) have been prepared by reactive DC magnetron sputtering from a metallic tantalum target in an argon/oxygen gas mixture. These films vary in thickness from 100 nm to 550 nm and have a refractive index of about 1.9. Films were characterized using XRD, UV-Vis-NIR spectroscopy and 4-probe electrical measurements. Optimally transparent films were deposited at a 5:1 argon to oxygen flow ratio and a chamber pressure of 20 mTorr. The sputter current for these films was held constant at 175 mA. We are exploring the fabrication of conducting tantalum oxide films through carbon doping. This can be done by adding carbon dioxide to the plasma. The results of this work will be discussed at the conference.

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