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Optical constants and transient absorption of solution-deposited RuO2 thin films JEFFREY OWRUTSKY, RYAN COMPTON, JAMES LONG, CHRISTOPHER CHREVIN, KONRAD BUSSMANN, ADAM DUNKELBERGER, BRYAN SPANN, IRINA PALIN, DEBRA ROLISON, PAUL CUNNINGHAM, JOSEPH MELINGER, PAUL DESARIO, Naval Research Lab, DAN WEIDINGER, Schaffer Corp., EDWIN HEILWEIL, National Institute of Standards & Technology
— Optical and electrical conductivity properties are determined for the promising, broadband transparent conductor material, solution-deposited RuO_2 nanostructured films. The 10-30 nm thick films or nanoskins are less conductive but more optically transmissive than polycrystalline, sputtered RuO_2 films which are inherently metallic. The optical constants (0.6 to 4.5 eV) determined by ellipsometry show that ϵ_1 is positive for the nanoskins in the spectral region investigated so they are not plasmonic. Transient picosecond absorption with visible (400 nm) pump and various probe wavelengths (visible and THz) are performed for nanoskins calcined to different temperatures. When heated to 200°C the absorption increases in the visible and THz. After heating to 300°C, the films become more polycrystalline and there is evidence for the appearance of a new absorption. Deceased absorptions or bleaches are observed in the THz and for longer visible wavelengths (> 750 nm). The absorption is ascribed to a damped plasmon band of the crystalline nanoparticles formed in the film upon heating.

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