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**Low temperature growth of conformal, transparent conducting oxides**

ROY GORDON, Harvard University

Transparent conductors (TC) are essential components of many widely-used technologies, including energy conserving low-E windows, electronic displays and solar cells. Currently, TC films are made by chemical vapor deposition (CVD) or by sputtering or evaporation (PVD). CVD has generally required high temperatures (greater than 500 C), so that is not applicable to plastic substrates and some solar cells. PVD makes films with low step coverage, so textured substrates, such as those with narrow holes, cannot be coated uniformly. The most effective PVD films are based on indium, a rare and expensive element. Recently, atomic layer deposition (ALD) processes have been developed that overcome all of these limitations, allowing highly uniform and conformal coating of substrates with very narrow holes even at substrate temperatures below 100 C. The metals used in these ALD TCs are tin and/or zinc, which are abundant and inexpensive elements. In this talk, we will review these ALD processes, along with the optical, structural and electrical properties of the TCs that they produce. Applications of these low-temperature, conformal TCs will also be discussed. Record-breaking solar cells made entirely from Earth-abundant elements were enabled by these ALD processes. Transparent transistors with excellent characteristics can now be made at low temperature even on rough or textured plastic surfaces. Micro-channel plate array detectors are being produced for use in highly sensitive imaging applications.