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Developing New TCOs for Renewable Applications

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Transparent conducting oxides are enabling for a broad range of optoelectronic technologies. Not only are conductivity and transparency critical but many other factors are critical including: carrier type, processing conditions, work function, chemical stability, and interface properties. The historical set of materials cannot meet all these needs. This has driven a renaissance in new materials development and approaches to transparent contacts. We will discuss these new developments in general and in the context of photovoltaics specifically. We will present results on new materials and also the development bilayer structures that enable charge selective contacts. Materials set includes amorphous materials for hybrid solar cells like InZnO and ZnSnO, it includes Nb and Ta doped TiO₂ as a high refractive index TCO and it includes the use of thin n- and p-type oxides as electron and hole selective contacts such as has been demonstrated for organic photovoltaics.

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