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**The Many Facets of ZnO: Sunscreen, Electronics Plasmonics**

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ZnO is an old material, but keeps reinventing itself as new applications come to mind. In fact, a book written back in 1957 is entitled, "Zinc Oxide Rediscovered." In the mid-1990s ZnO was again rediscovered, as a potential large-area substrate for GaN-based laser diodes and microwave transistors and as a very bright UV emitter in its own right. At that time, we and many others began trying to make p-type ZnO, necessary for a p/n-junction laser diode. While this quest has been only marginally successful, two more recent applications will almost certainly be important in our future. The first is driven by the need for cheaper transparent electrodes (TEs), which are used in nearly all solar cells, active-matrix displays, and LEDs. The dominant TE material at present is Sn-doped $In_2O_3$ (ITO), but In is scarce and somewhat toxic and has become very expensive. Ga-doped ZnO (GZO) has no such problems and is poised to grab this market if some fundamental issues can be resolved. Another exciting application is the formation and processing of light/plasmon waves in electronic circuits. These waves can propagate along a metal/dielectric interface with sub-wavelength confinement and be processed in the circuit before the light is transferred back to the air or a fiber. However, for near-infrared light, such as that used in fiber-based communications, metals are very lossy and highly-doped semiconductors such as GZO would be much better. Both the TE and plasmon applications involve thin GZO films grown on lattice-mismatched substrates such as Si, and we will discuss new ways of characterizing and improving such films.