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## "Annie get your 'GaN'": III-nitrides for energy applications

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Development of wide-band gap compound semiconductors materials and devices led by the III-Nitrides are fueling a Drevolution for energy related applications. The III-Nitrides can provide an universal solution for many applications and traditionally III-V devices are used. LEDs have been very successful in niche markets but still have not seen significant penetration in generation illumination. To achieve high quality, white light gaps in the power spectrum of typical LED sources have to be eliminated. Broadband spectrally dynamic solid state illumination source comprising of a two terminal dual LED structure has been developed. A combination of multiple phosphors are then "pumped" by either or both of the wavelengths emitted from the dual LED to produce white light of a variable power spectrum. Such innovations will help further increase the competitive advantage over conventional illumination sources. The III-nitrides are also the basis for a new generation of highly efficient solar cells. In GaN with indium compositions up to 30% (2.5 eV band gap) have been developed for photovoltaic applications by controlling defects and phase separation. In GaN solar cell design involving a 2.9 eV InGaN p-n junction sandwiched between p- and n-GaN layers yields internal quantum efficiencies as high as 50%; while devices utilizing a novel n-GaN strained window-layer enhanced the open circuit voltage. These results establish the potential of III-nitrides in ultrahigh efficiency photovoltaics. Some recent measurements of the thermoelectric properties-the Seebeck coefficient, the electrical conductivity and the power factor - of GaN and InGaN thin films will also be reported.

## Biography

Ian Ferguson is currently a Professor and the Chair of Electrical and Computer Engineering at the University of North Carolina at Charlotte. Prior to this he has held leadership positions in both academia (St. Andrews, Imperial College, Northwestern, Georgia Tech, etc.) and industry (GEC, EMCORE, etc.). He has authored over 440 refereed publications and has given over 330 invited and contributed talks and seminars throughout the US, Europe and Asia. He is a Fellow of Institute of the Electrical and Electronic Engineering (IEEE), the Institute of Physics (FInstP), and the International Society for Optical Engineering (SPIE).

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