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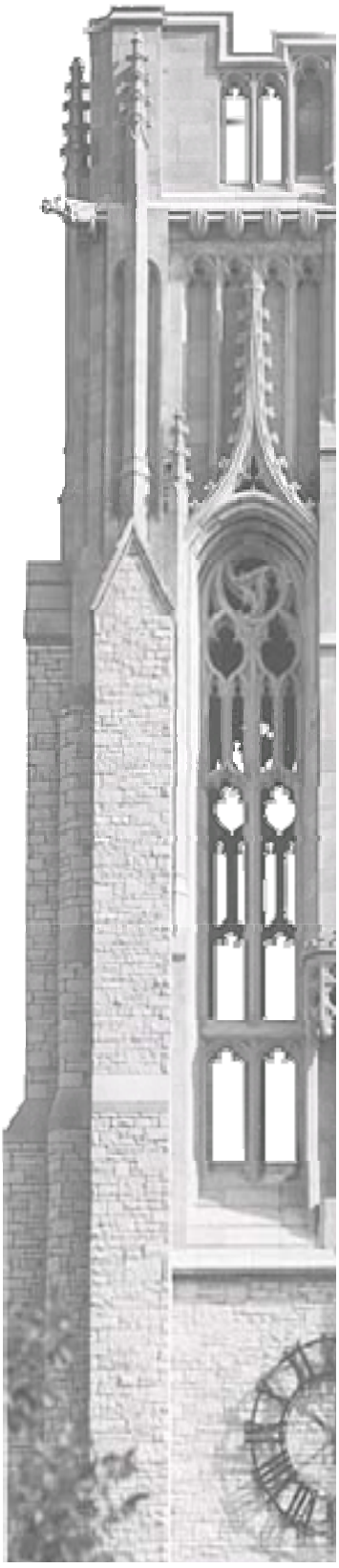
Nano-Dipole Photovoltaics



The concept of nanoparticles in polymer blends has long been proposed for the emerging technology of third-generation photovoltaics (PV). Third-generation PV are proposed to be very different from the previous semiconductor devices as they do not rely on a traditional p-n junction to separate photo-generated charge carriers. Third-generation PV are still in the research phase and one common assumption is the use of electrically non-polar particles which make such systems significantly different from the earlier generation p-n junction PV with the built-in electric field. Third-generation PV systems rely on diffusion current and charge separation only at the electrode interfaces resulting in inefficient charge carrier collection. Therefore, a qualitatively different third-generation PV system has been developed that utilizes the built-in electric field generated by aligned nano-sized dipoles in a semiconductive host. It has recently been discovered that many nanoparticles are strong electric dipoles and that certain properly stabilized nanoparticles have permanent dipole moments. Such dipoles are readily found with many existing nanoparticles and the field generated by them can be uniform and strong enough to separate electron-hole pairs and run significant drift currents.

The University of Toledo is seeking a company interested in utilizing this nano-dipole photovoltaic system that does not utilize typical p-n or Schottky junctions and that can be used in various applications, including screen printing, and implemental with the standard and flexible substrates, amorphous, polycrystalline, polymer, and even fluid materials

Applications:

1. Photovoltaics
2. Thin film semiconductor devices
3. Active matrix liquid crystal displays
4. Light emitting devices

Advantages:

1. Extremely cost effective
2. Tunable in a broad range of parameters
3. No electric contact between materials is needed
4. Dipole fields can emulate p-n junctions

This invention is patent pending

Contact

The University of Toledo Office of Research Development,
MS 1034
3000 Arlington Avenue
Toledo, Ohio 43614

Phone: 419-383-6963
E-mail: stephen.snider@utoledo.edu