Printing Solar Energy –
Molecular Approaches to a Scientific Dream

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Abstract:

Solar energy provides limitless resource for human being to address the terawatt energy challenge. The ideal photovoltaic (PV) technology needs to be earth abundant, non-toxic, and very low cost etc. Scientists have long dreamed of printing solar cells like newspaper, and can apply to any surface to generate electricity.

Solution processed solar cell based on organic polymer (Macromolecule) and organometal halide hybrid perovskites are both promising candidates for printable PV technologies. The advantages include low material cost, low temperature fabrication and their compatibility with printing/coating processes (roll-to-roll), high material utilization etc. They also provide attractive properties like flexibility, light weight, and transparency.

This talk will first cover some of key progresses in solution processed polymer solar cells: (a) Morphology control and understanding; (b) OPV molecule design; (c) Organic semiconductor/electrode interfaces; and (d) Device architecture investigation (inverted architecture, inverted tandem polymer solar cell) for high performance OPV with over 11% efficiency. Recent work in UCLA on organometal halide perovskite solar cells with high efficiency through active layer and interfacial layer engineering will be discussed, followed by hybrid tandem solar cells based on organic/inorganic materials. The R&D challenges & opportunities on printable solution process solar cell as viable PV technology will be discussed.

Biography:

Gang Li is an Associate Research Professor in the Department of Materials Science and Engineering at UCLA. His research interests are organic and hybrid advanced materials and devices for energy applications. He received PhD (Condensed Matter Physics) and MS (EE) degrees from Iowa State University in 2003. His postdoc research in UCLA (2004-2007) was on polymer solar cells and LEDs. Prior to joining UCLA as a research faculty member in 2011, he spent 4 years in industry leading OPV research and development, including materials development and roll-to-roll printing. He is a Thomson Reuter's Highly Cited Researcher (Materials Science, 2014 & 2015), and has an H-index of 53.