Rapid Photonic Processing of Films in Roll-to-Roll Applications

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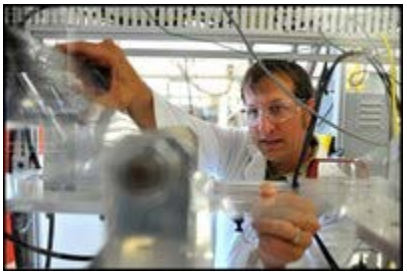
Abstract

Roll-to-roll processing is an extremely common manufacturing technique to additively deposit films over wide areas at extremely high speeds at very low costs. The typical manufacturing line is several hundred feet long dominated by the oven that must accommodate a dwell time of a few minutes for a web that is moving at 100 feet per second. Although this accepted protocol has been established over decades of operations, it does incur inefficiencies, downtime and yield issues. Technologies that can reduce the habitual reliance on large scale ovens will improve the throughput and reduce costs of advanced roll-to-roll manufacturing. Our work in the past decade has been to explore rapid radiative thermal processing of nanocomposite thin films to reduce the thermal processing footprint. The work spans the polymerization of monomers, sintering of metals and chalcogenides and the annealing of complicated metal organic halides, all of which can be accomplished in a matter of seconds. In this talk the rapid photonic processing will be described for applications in thin films for optics and energy generation. The technical aspects of the manufacturing process including the impact of nanotechnology will be covered as well as the outlook for commercialization.

Biography of Presenter



Thad Druffel, PhD, PE is currently Theme Leader, Solar Manufacturing R&D at the Conn Center for Renewable Energy Research at the University of Louisville. His current research is focused on developing materials and processes for roll-to-roll manufacture of devices for renewable energy. The work involves using near atmospheric processes to consolidate the nanomaterials into functional bulk thin films. Of particular interest is the use of intense pulsed light sources which heat large areas using a broad spectrum of intense light delivered in very short pulses. His twenty year background in industry includes research, development and engineering topics in several engineering disciplines and he has been involved in projects ranging from solar and water facilities in Africa to corporate research and development of cutting edge technologies. He has PhD in Chemical Engineering, M.Sc. in Mechanical Engineering and is a registered Mechanical Engineer in the Commonwealth of Kentucky. He is active within the entrepreneurial community and continues to be involved in startups. He co-founded Bert Thin Films, LLC along with a former post-doctoral researcher to commercialize a technology that was initially conceived at the Conn Center.