OAK RIDGE NATIONAL LABORATORY

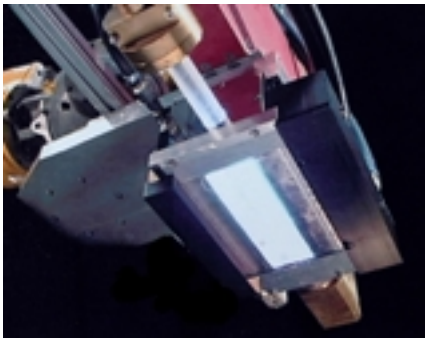
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

Revolutionary Processing Technology for PV Materials

Concept: The Oak Ridge National Laboratory (ORNL) has a unique infrared processing technology for rapid thermal annealing of PV thin film and nano- particle materials. This process utilizes a high density infrared technology that offers heating rates that are orders of magnitude greater than any other source currently available. This technology has power densities of a laser but with a processing area as large as 300 ² cm. **This technology has the potential to increase the efficiency of PV materials by 50% or greater as result of the post-deposition annealing process while increasing the production rate and reducing production costs.**

Present Capabilities**:**

- 300-750kw Power Output
- 300cm² Processing Area
- Millisecond Pulse Rate to 12 Megawatts
- Approaching Laser Power Density Levels



IR Processing Facility.

Impact: The photovoltaic and microelectronics industries have the need for advanced processing technologies that will enable the production of more efficient devices at a higher rate and at reduced cost. One approach to obtaining these requirements is the implementation of a post-deposition rapid thermal annealing technology that enables large area processing and faster product throughput. This process also enables the annealing of thin films on polymer type substrates which cannot be accomplished with existing technology. There are numerous opportunities in addition to PV materials where this technology can improve device efficiencies and decrease processing time and cost. Some potential applications are as follows:

- Magnetic Recording Media
- Solid State Thin-Film Batteries
- Solid State Lighting
- Thermo-Electrics
- Magneto-Optical Recording Media
- Thin-Film Transducers
- Capacitors
- LED's

Proposed Development: Preliminary feasibility type experiments have demonstrated that the proposed processing technology has the potential to make a very significant impact in advancing the production and performance of microelectronic and PV devices. In fact this technology could very well be considered disruptive considering the potential impact that it can make in these industry areas. In order to realize its full potential, some immediate steps need to be taken to address the following issues:

- Further develop and refine the post-deposition annealing process
- Apply the refined process to state-of-the-art PV materials
- Verify improved PV materials performance

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