Rapid Thermal Processing in CdS/CdTe Thin Film Solar Cells by Intense Pulsed Light Sintering

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Development of market competitive solar cells requires not only the improvement of low cost deposition methods, but advancement of the material processing techniques. Typically, semiconductors deposited through low cost routes require post-deposition heat treatment in order to improve the materials properties. As a result, costs saved during the fabrication stage can be lost during the processing stage. One way to tackle this problem is to use rapid thermal sintering under atmospheric conditions which can drastically cut down processing times from tens of minutes to 1-2 minutes. Intense Pulse Light (IPL) sintering is one such technique that could potentially combat this problem. Unlike traditional heat treatment methods, heating is initiated through the absorption of light from the UV to IR region, resulting in localized heating. Consequently less energy is wasted to the substrate and surroundings. To date, Ag and Cu electrical contacts for use in electronic circuits have been developed using IPL, however little work exists on the employment of IPL to process semiconductor materials and solar cells. In this study a low-cost deposition technique has been coupled with IPL. CdS and CdTe thin films were fabricated by electrochemical deposition (ED). ED CdS/CdTe thin film solar cells require the heat treatment of both the CdS and CdTe layers together with $CdCl_2$ treatment. The effects of the total energy input and the energy density of the pulse on the materials properties were investigated. Improvements to the optical, morphological and crystalline properties were observed. Unlike most conventional sintering techniques results have shown that IPL sintering has a top down approach (i.e. surface to substrate). As a result this process has the potential to avoid detrimental Na diffusion from the glass substrate to the CdS layer.

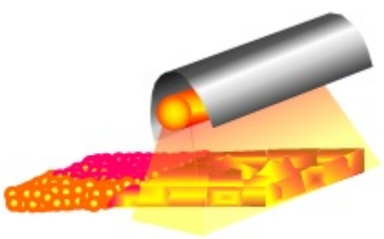

Figure 1. Schematic Image of the Intense Pulsed Light (IPL) sintering.