

## The Technology of Cu(InGa)Se<sub>2</sub> Photovoltaics: Approaches and Challenges

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Cu(InGa)Se<sub>2</sub> based photovoltaics have achieved the highest efficiencies of any thin film materials, with 20% efficient small area solar cells and 13.5% efficiency large area modules, and are nearing industrial maturity with annual production capacity of several 100 MW worldwide. The variety of approaches to module manufacturing include: different methods for thin film deposition; glass-based rigid modules versus flexible modules with roll-to-roll processing; and batch versus continuous processes. Criteria that are addressed in choosing these approaches include process throughput and yield, materials utilization, module performance, and the final form of the module. The status and basic technology of Cu(InGa)Se<sub>2</sub> photovoltaics will be described and the challenges that need to be addressed to fulfill its promise for low cost solar electricity addressed.