




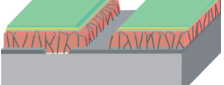


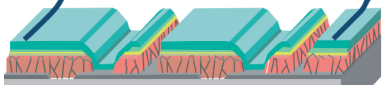

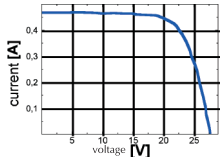


## The Sequence of Processing Steps for the Production of a Cu(In,Ga)Se<sub>2</sub> Thin-Film Solar Module

Standard Process		Development
<b>Substrate (2-4 mm)</b> window glass, cleaning		flexible, light polymer and metal foils
<b>Back contact</b> Mo, DC sputtering		barriers, Na precursor
<b>Patterning line (P1)</b> laser patterning		
<b>Absorber (2 μm)</b> Cu(In,Ga)Se <sub>2</sub> , in-line co-evaporation		higher Ga content low-temperature process multi-stage process
<b>Buffer layer (0.05 μm)</b> CdS, chemical bath, i-ZnO, RF sputtering		alternative buffer layer MOCVD and ALD
<b>Patterning line (P2)</b> mechanical patterning		laser techniques photolithography
<b>Front contact (1 μm)</b> ZnO:Al, DC sputtering		reactive sputtering
<b>Patterning line (P3)</b> mechanical patterning		laser techniques photolithography
<b>Contacts</b> metal tapes, bonding		ultrasonic welding, soldering
<b>Encapsulation</b> polymer lamination / glass (frame)		various encapsulation materials (without glass) flexible encapsulation special modules, building integration...
<b>Characterisation</b> I/V Test		film analysis: QE, LBIC etc.