

## DS 4: Invited – Tiwari

Time: Monday 14:00–14:45

Location: GER 37

**Invited Talk**

DS 4.1 Mon 14:00 GER 37

**Low temperature grown high efficiency Cu(In,Ga)Se<sub>2</sub> and CdTe flexible solar cells** — ●AYODHYA TIWARI, ADRIAN CHIRILA, PATRICK BLOESCH, JULIAN PERRENOUD, KRENZ LUKAS, SIGHRAD SEYRLING, FABIAN PIANEZZI, RAJNEESH VERMA, SHIORO NISHIWAKI, STEPHAN BUECHELER, and YAROSLAV ROMANYUK — , Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland

CdTe solar cells of 15.6% efficiency have been developed on glass substrates using evaporated CdS/CdTe layers and keeping the overall processing temperature to below 450 °C. This process has been applied to develop up to 12.4% efficiency flexible solar cells and a laser pattern-

ing technology has been used for the development of monolithically interconnected flexible modules. Effects of various layers, processes and parametric optimization for achieving high efficiency will be presented. Properties of layers and interfaces will be correlated with the photovoltaic properties of solar cells.

CIGS solar cells are developed with co-evaporation of elements Cu, In, Ga, Se, in a specific manner that gives compositionally graded layer where Ga grading changes along the layer thickness. The composition gradient and structural characteristics of the CIGS absorber depend on the substrate temperature, NaF, and evaporation flux profiles. Properties of CIGS layers and NaF incorporation are optimised for flexible CIGS solar cells on polymer and stainless steel foils with efficiencies exceeding 18%.