Alkali:In_xS_y alternative buffer layer for Cu(In,Ga)Se_2-based solar cells: A material analysis

Polyxeni Tsoulka[1], Sylvie Harel[1], Elizabeth Palmiotti[2], Angus Rockett[2], Ludovic Arzel[1], Nicolas Barreau[1]

[1] Université de Nantes, CNRS, Institut des Matériaux Jean Rouxel, IMN, F-44000, Nantes, France

[2] Colorado School of Mines, Golden, Colorado, U.S.A.

The cadmium sulfide (CdS) buffer layer deposited by chemical bath deposition (CBD) is one of the most widely used buffers in the CIGSe-based solar cell market. However, the toxicity of cadmium is a well-known disadvantage in the CdS-based buffer technology and the CBD process is a major drawback for the industry.

In this work, we study alkali-free and alkali-doped (Alkali:In_xS_y) buffer layers in order to i) find an alternative buffer layer and ii) develop an industrially viable and low-cost deposition process that can be easily used for in-line dry procedures.

Therefore, we first investigate through SEM and XPS analyses the morphology and the chemical composition of the buffer's surface. Secondly, we examine the distribution of the elements via TOF-SIMS to investigate the diffusion phenomena at the CIGSe/buffer interface. Our first results indicate that "impede" the diffusion of copper through a Rb-based post-deposition treatment is an important factor for the effectiveness of the In_xS_y buffer layers.