Title: Combinatorial alkali post-deposition treatment under S and Se atmosphere on Cu(In,Ga)Se_2 absorber layers

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Polycrystalline Cu(In,Ga)Se_2 (CIGSe) is one of the most promising materials used as absorber layer in the thin-film solar cell technology, due to their high efficiency, low manufacturing cost and robustness. It is well known that alkali (K, Na, Rb, Cs) post-deposition treatment under vacuum or under Se atmosphere is a key parameter that improves the conversion efficiency of the solar cell. The partial sulfurization of CIGSe layers is also recognized as being beneficial[1], since it increases the bang gap of the surface and decreases the recombination losses at the absorber/buffer interface.

In this work, we present combinatorial (RbF, In+RbF, NaF+RbF) post-deposition treatments under S and Se atmosphere, on CIGSe co-evaporated absorber layers. By coupling Raman, XRD, J(V) and EQE analyses we examine the impact of the sulfurization and selenization process on the chemical, structural and electronic properties of the solar cells. Our EQE and J(V) results show that the recombination effect at the CIGSe/CdS interface depends on the atmosphere (S or Se) chosen for each post-deposition treatment and that a surface with a wider band gap (CIG(S)Se) is beneficial.

Reference

[1] D. Ohashi, T. Nakada, A. Kunioka, Improved CIGS thin-film solar cells by surface sulfurization using In_2S_3 and sulfur vapor, Sol. Energy Mater. Sol. Cells 67 (2001) 261–265, https://doi.org/10.1016/S0927-0248(00)00290-7