

## MAP-fis Essay Proposal, 2015-2016

### Supervisors

*Name: Joaquim Fernando Monteiro de Carvalho Pratas Leitão / Pedro Salomé*

*e-mail: joaquim.leitao@ua.pt / pedro.salome@inl.int*

### Title

Radiative transitions in  $\text{Cu}_2\text{ZnSn}(\text{S},\text{Se})_4$

### Area

Physics of Semiconductors

### Summary of Proposal

This essay aims to review the radiative transitions in  $\text{Cu}_2\text{ZnSn}(\text{S},\text{Se})_4$  discussed in the literature as a starting point for the investigation of the electronic levels transition structure by photoluminescence. In the literature, several contradictory identifications are reported and it is expected that the student critically address such reports. The nature of the observed transitions should be identified and compared with available theoretical models and the role of defects must be highlighted.

The contribution of the study of the optical properties is very important for the evaluation of the limiting parameters of the resulting thin film solar cells. Based on this overview, the student should also present a research proposal and propose a set of studies that would allow her/him to carry out the research.

### References

*(to allow students first look at topic)*

Clean Electricity from Photovoltaics., edited by M. D. Archer and M. A. Green London, London: Imperial Colledge Press, 2014.

The current status and future prospects of kesterite solar cells: a brief review, Progress in Photovoltaics: Research and Applications. DOI: 10.1002/pip.2741.

Band tailing and efficiency limitation in kesterite solar cells, T. Gokmen et al., Appl. Phys. Lett. 103, 103506 (2013).

Prospects and performance limitations for Cu–Zn–Sn–S–Se photovoltaic technology, D. Mitzi et al., Phil. Trans. R. Soc. A 371, 20110432.



Universidade do Minho

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Wide-Gap Chalcopyrites , S. Sibentritt and U. Rau (Eds.), Springer, 2006.