

MAP-fis Essay Proposal, 2016-2017

(please write in English)

Supervisors

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Title

Influence of fluctuating potentials in the optical properties of solar cells based on chalcogenides

Area

(Materials, Optics, Condensed Theory, High Energy Theory,...);

Materials

Summary of Proposal

The essay should be focused on the influence that fluctuating potentials have on the optical properties of chalcogenides materials with relevance for the $\text{Cu}(\text{In,Ga})\text{Se}_2$ and $\text{Cu}_2\text{ZnSn}(\text{S,Se})_4$. The work should cover a few topics:

- experimental evidences for different types of fluctuating potentials;
- characterization of the dominant fluctuating potentials;
- relation between defects and fluctuating potentials;
- possible experiments to identify the presence of fluctuations on optical measurements, in particular photoluminescence;
- a research proposal on the topic.

A deep enough state of the art review should be provided in the manuscript.

References

(to allow students first look at topic)

- B. I. Shklovskii and A. L. Efros, Electronic Properties of Doped Semiconductors, Springer Series



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- P. W. Yu, J. Appl. Phys. 48, 5043 (1977)
- A. P. Levanyuk and V. V. Osipov, Soviet Phys. Usp. 24, 187 (1981)
- P. V. Mieghem, Reviews of Modern Physics 64, 755 (1992)
- J. P. Leitão, N. M. Santos, P. A. Fernandes, P. M. P. Salomé, A. F. da Cunha, J. C. González, G. M. Ribeiro, and F. M. Matinaga, Phys. Rev. B 84, 024120 (2011)
- T. Gokmen, O. Gunawan, T. K. Todorov, and D. B. Mitzi, Appl. Phys. Lett. 103, 103506 (2013)