

Post-doctoral position offer (February, 2015 - July, 2016)

Elaboration and characterization of alternative thermoelectric materials

Context

In the framework of the granted **European project TIPS** (2015-2018) dealing with **thermal management of integrated optoelectronic devices**, specific tasks are dedicated to the development, characterizations and integration at the micro-scale of **thermoelectric (TE) materials** on photonic platforms. The scarcity of abundant, efficient and environment-friendly TE materials working at room temperature has led to intense research and developments of novel TE materials. One of the main challenge is to obtain both large electrical conductivity and thermal resistivity, where nanostructures can play a significant role [1]. Integration of *n*- and *p*-type TE materials into the complex device structures, keeping low contact resistances and current leakage, is a further challenge [2].

Working plan

The contracted researcher will have to **synthesize** promising thermoelectric materials (in particular *n*-type doped SrTiO₃) by physical methods (molecular beam evaporation, sputtering) and chemical methods (chemical solution depositions). Special interesting nanostructured composite materials could be realized at INL by combination of different materials and elaboration techniques (for instance, nanowires in an electrically-conducting matrix).

The contracted researcher will also have to **characterize electrically** (conductivity, mobility), **thermally** (conductivity), and **thermoelectrically** (Seebeck coefficients) the developed TE materials, ideally in the *in-plane* and *out-of-plane* configurations. Some of the characterizations will be done in collaboration with other laboratories, and other particular characterizations could also be done (UPS, PPMS in temperature for instance). Special attention will be paid to contact resistances and leakage currents of TE materials with metallic and oxide electrodes.

Requisite skills

The candidate must have strong knowledge in solid state physics and material sciences (physical and chemical elaborations; structural, chemical and physical characterizations). He must be specifically familiar with oxide/semiconductor thin films, and its structural and thermal/electrical characterizations.

General informations

Location: The contracted researcher will be located at INL in the team "*Heteroepitaxy and nanostructures*" (ECL site). There will be collaborations with "*Electronic device*" team of INL (INSA site) for some electric measurements, ILM (UCBL site, campus La Doua) for *in-plane* Seebeck measurements (Contact: S. Pailhes); IMN (Nantes) for thermal measurements (Contact: A. Djouadi). Other punctual collaborations could be established with other laboratories for complementary measurements.

Duration: 18 months. / **Salary:** ~2000 euros net /month.

Contacts

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References

- [1] C. J. Vineis *et al.*, Adv. Mat. **22**, 3970 (2010)
- [2] G. J. Snyder *et al.*, Nat. Mat. **7**, 105 (2008)