18èmes Journées de la Matière Condensée
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Société Française de Physique

Titre: Disorder semiconductor alloys: physics, devices and metallurgy

1. **Organisateurs (avec affiliation, usuellement 2 ou 3 personnes) :**
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2. **Parrainage ou lien avec des sociétés savantes, des GDR ou autres structures**
RéMiSol - Réseau Microscopies à Sondes Locales.
NS-CPU - Nanosciences with near-field microscopy under ultra-high vacuum
SFP - Société Française de Physique
EPS - European Physical Society

3. **Résumé de la thématique du minicolloque :**

Alloying of semiconductors is routinely used to engineer the desired bandgap of a range of materials for opto-electronic and photo-voltaic applications [1]. The random placement of the constituent atoms in the crystal lattice, known as intrinsic alloy disorder [2], is unavoidable and can significantly modify the local opto-electronic properties at the scale of the disorder. Depending on the details of the application, these modifications can be beneficial or problematic for device performance. Either way, a variety of novel physical phenomena can be directly or indirectly related to alloy disorder.

The present mini-colloque will focus on physical phenomena related to alloy and compositional disorder in a range of technologically relevant materials systems, from III-V semiconductors [3] and 2D transition metal dichalcogenide alloys [4] to organic semiconductors and perovskites [5,6]. Quantum properties of the localized states resulting from potential fluctuations at the nm scale, the metallurgy of intrinsic alloy disorder, and the consequences for device applications will be discussed.

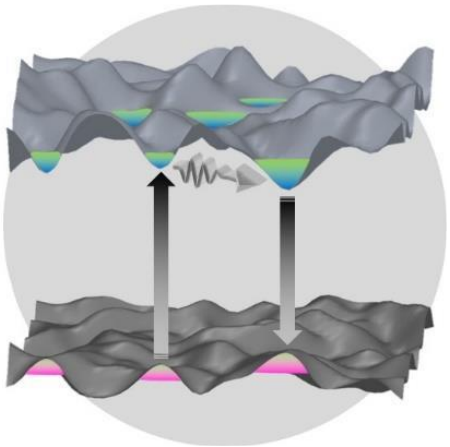

Figure 1: In-plane disordered electron and hole effective energy levels with localization landscape.

[1]C. Weisbuch et. al, Nanophotonics **10**, 3 (2021)
[2]L. Rigutti et al., J. Appl. Phys. **119**, 105704 (2016)
[3]M. Piccardo et al., Phys. Rev. B **95**, 144205 (2017)
[4]H. Masenda et al., Adv. Electron. Mater. 2100196 (2021)
[5]J.C. Blancon et al., Nature Nanotech. **15**, 969 (2020)
[6]X.-G. Zhao et al., Materials Today **49**, 107 (2021)