Conjugated Polymers for Thermoelectrics and Magnetosensing

Abstract: With world's reserves of fossil fuels being depleted rapidly, researchers are working towards the quest for new and more environmentally friendly sources of energy. Furthermore, it is estimated that >60% of the energy is lost in the form of waste heat, resulting in useless dissipation and environmental pollution. Hence, it appears clear that recycling waste heat is of utter importance, and for this reason, more and more attention is being paid to thermoelectric materials, i.e., materials that are capable of converting a heat gradient into electricity. In this presentation I will give a few examples on how to use conjugated polymers to make organic thermoelectric generators. On the one hand, I will talk about the versatility of inkjet printing technology with a commercial PEDOT:PSS ink to evaluate the thermoelectric performances of films deposited on different substrates (polyimide foils, glass, and silicon oxide) [1]. The substrate wettability and the printing direction were found to strongly impact the resulting thermoelectric performances. Moreover, to investigate the thermoelectric performances of a fully inkjet-printed flexible thermoelectric device, we compared the role of e-beam evaporated vs. inkjet-printed electrodes. In addition, I will present a novel polymer with a joint polaronic and radical conductivity which brings to a higher conductivity which is pivotal to achieving a high thermoelectric figure of merit [2, 3, 4]. Finally, I will cover the fundamentals of magnetotransport in conjugated polymers films [5]

References

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Emanuele Orgiu – Short Biography

Emanuele Orgiu is a Full Professor at Institut national de la recherche scientifique (INRS) - University of Quebec in Montreal (Canada) where, since 2017, he leads the Laboratory of Molecular and Device Physics (www.orgiuresearchgroup.com).

Previously, he was an Assistant Professor at the University of Strasbourg (France) within the Institut de science et d'ingénierie supramoléculaires. Alongside his international team, he works on several topics such as the experimental investigation of charge, heat and magneto- transport in organic and 2D materials. His focus is based on the use of devices to gain physical understanding of novel materials. He received his PhD in 2008 from the University of Cagliari, Italy. He received numerous recognitions: J.W. Fulbright scholar (2007), Marie Skłodowska-Curie postdoctoral fellow (2009-2011), MIT35 France award (2013), Prix de la Relève de l'Université du Québec (2018). He was recognized as Emerging Investigator (2017) and Pioneering Investigator (2023) by the Royal Society of Chemistry (RCS).

He is a member of the College of the Royal Society of Canada (since 2023) and the Young Academy of Europe (since 2016). He trained approximately 50 people among which, 4 became faculty members and at least 10 hold leading positions in industry and academia. He secured > 7 million $ funding across Europe and Canada. He published more than 110 papers, most of them in high impact factor journals. His research received ~ 7000 citations and led to an H-index of 40 (Google Scholar).

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