Suheda ISIKLI

Technology centre: Irish Composites Center (IComp), University of Limerick (UL)
Academic Mentor: Prof. Kevin M. Ryan
Commercial Partner: Glantreo
Commercial Mentor: Dr. John Hanrahan

Suheda received her Bachelor's degree in Middle East Technical University, Turkey. In 2009 she started her Master's degree in Autonomous University of Madrid, Spain, focusing on Energies and Fuels for the Future. In 2009 Suheda started her Joint Doctoral degree in Madrid Institute of Advanced Studies and Autonomous University of Madrid doing research on Synthesis of quinone-based organic redox compounds and their applications in electrochemical energy storage devices. She has a 5-year industry experience together with her academic career.

Prof Kevin M. Ryan

Prof Kevin M. Ryan is the Principal Investigator (PI) of the Nanotechnology Research Group at the Bernal Institute and also holds a Personal Chair in Chemical Nanotechnology at the Department of Chemical Sciences (CS) at the University of Limerick. He is Co-PI on SFI research Centers Amber (Applied Materials and Bioengineering Research) and MaREI (Marine and Renewoable Energy) and funded investigator on the SSPC (Solid State Pharmaceutical Centre (SSPC). He is holder of SFI Investigator and IRC Laureate awards and has a h-index of 33 with over 100 publications in peer-reviewed journals and 10 patents. He is coordinator of the EU projects Si-Drive and NeillsBat in the area of lithium ion batteries and supervises research in materials synthesis and applications across a range of technologies from energy to ICT. His current research group consists of 6 postdoctoral researchers and 18 PhD students funded by a range of funding sources including EI and Industry.

Dr. John Hanrahan

Dr. John Hanrahan is the Chief Technical Officer and one of the cofounders of Glantreo Ltd. The most successful parts of his early career research have been licensed to Glantreo and are currently been exploited commercially. Under his leadership, Glantreo successfully transitioned from the academic to commercial entity. This includes performing fundamental research breakthroughs and leveraging grants from the European Union and Enterprise Ireland. Dr Hanrahan led the effort to transfer Glantreo's patented technology (sub2silaTM) to a client site in the US. He has developed strong expertise in nanomaterials particularly in silica nanomaterials and he is keen to collaborate with the projects representing a potential to be a future commercial reality from a fundamental scientific research.

The Irish Composites Centre (IComp)

The Irish Composites Centre provides world class innovative R&D, consultancy and networking opportunities for industry throughout Ireland and across all sectors where there are opportunities to use composite materials and associated technologies. IComp provides the focal point in Ireland for academia and industry to work together to address some of the critical issues related to the use of composite materials which have been identified by IComp industrial members who include companies from the supply chain and, for example, the aerospace, land transport, construction, marine and renewable energy and consumer goods sectors.

Glantreo

Glantreo is a high-profile nanomaterials production SME in Ireland with a strong EU funding portfolio. Glantreo are developing and delivering innovative material science-based technologies, processes, services and products that can be used by customers and partners to deliver quality solutions. Glantreo's core market is nanomaterials for separation science, but they also provide a range of other nanomaterials plus services including characterization and test method development.

Suheda's project

"Design of a novel GEl composite POLYmer electrolyte for next generation safer, faster charging and higher ENErgy density lithium batteries (POLYGENE)"

Energy density is the most important parameter of a Li-ion battery as it defines the amount of energy we can get out of a battery versus their weight. Increasing the energy density in lithium ion batteries would dramatically increase the range of electric vehicles or allow longer lasting mobile phones with a smaller portion of the handset space occupied by the battery.

New innovations in the battery materials particularly at the anode (negative terminal) can allow massive increases in energy density. However, this can come at a safety cost, that remains a considerable bottle neck for industry uptake of these so-called lithium metal technologies. In particular, the amount of battery in an Electric Vehicle (equivalent to 1000 laptops) and the thermal runaway experienced during impact means the safety aspects of new technologies are paramount.

A route to making lithium metal battery viable is to move from a flammable liquid electrolyte to a solid-state electrolyte. This substantially lowers the flash point for thermal runaway during impact and reduces the possibility of shorting in individual cells by dendrite formation (growth of lithium wires that penetrate the separator and short the cell). The POLYGENE project proposes a gel-type electrolyte system where the liquid electrolyte component is trapped into a composite polymer network.

The resulting system eliminates the risk of electrolyte leakage and ensures a safer battery operation. The target electrolyte formulation will be adapted in a lithium metal polymer battery in order to double the energy density of current state of the art technologies.