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Carbon Fibre Composite Materials and Hetero-structures with Built in Functionality

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ABSTRACT

Ideally, we would like to build a material system from scratch, atom by atom engineering. Then you would be able to build in functionality on a material level. Imagine, you create a hetero-structure such as say the top layer acts as a sensor, the next few work as amplifier and interconnects, few layers act as mechanical reinforcement. Somewhere there would also be a solar cell to generate power to run the whole circuit. Multi-layered carbon fibre reinforced composites together with 2D materials such as graphene will enable such structural configurations to be tailored according to needs. In this talk, applications of modern composite systems will be presented and achievements, but also challenges and limitations will be discussed, in the non-destructive damage characterisation (microscopic) and modelling of such materials with some thoughts on future developments and prospects for novel multi-functional materials (graphene based composites, 3D woven architectures) and processes that offer real time structural health monitoring (SHM), self-healing and repair capabilities.