

Direct-writing and embedding of functional materials into construction materials to enable smart cities

Regana Vasanthanayagam¹, Ian Fausto Zanchetta Chittka², Chrysoula Litina¹, Maria Cristina RodriguezRivero¹, Javier Orozco-Messana², Abir Al-Tabbaa¹ and Ronan Daly¹

¹University of Cambridge, UK, ²Universitat Politècnica de València, Spain

Control of 2D patterns of nanomaterials by inkjet printing has already shown the potential to create devices and functional surfaces for emerging product technologies such as transparent flexible electronics and printed sensors. Here we describe the embedding of functional 2D materials into the near-surface regions of composite construction materials, namely cement and ceramic tiles. Both mineral composite materials are important in architectural applications, so the delivered functions can be used to support initiatives in Smart Cities. These are challenging surfaces for controlled 2D material integration and have to-date been neglected from detailed functional printing research.

These challenges will be discussed with a focus on two exciting and emerging examples. Firstly, we will report the challenges of integration of functional nanomaterials into the ceramic tile fabrication process, including compression, printing onto porous media and firing. Secondly, we will examine the integration of materials into cements at different stages of the formation process. We show here the importance of understanding the interdependencies between the advanced functionality of emerging materials and their associated manufacturing technologies.