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Printing pharmaceuticals

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Recent trends in the area of pharmaceutical products research and development appear to be directed more towards new drug delivery systems as well as new physical forms of existing APIs with enhanced properties such as polymorphs and co-crystals. Understanding the factors affecting crystallization of different polymorphic forms is highly important as good control over the conditions that produce each form is key in manufacturing pharmaceutical products. We have pioneered the use of inkjet printing to crystalise metastable polymorphic forms of pharmaceutically related materials such as mannitol, glycine and 10,11-dihydrocarbamazepine. By utilizing the unique deposition capabilities of the inkjet printing system Jetlab 4x® (Microfab Technologies Ltd, USA), droplets of size down to 100 pL were dispensed on various substrates including glass and aluminium. Phase identification was achieved by Raman microscopy, and by printing onto X-ray diffraction mounts (Micromesh™, MiTeGen) powder X-ray diffraction data were collected for crystals in droplets as small as about 5 nL. It seems that the fast evaporation rate of the printed droplets prevented the conversion of metastable forms to the stable forms, which allowed their identification. For example the most unstable form of glycine (β form) was crystallised predominantly as its solvent-mediated transformation to the stable αfrom was prevented in small printed droplets. By combining the capabilities of both inkjet printing and analytical characterization methods such as Raman microscopy and X-ray diffraction, the interesting process of crystallisation in confinement was studied where metastable forms seems to predominantly crystallise in the printed droplets. In conclusion, inkjet printing appears to provide a new approach to crystallization in confinement with great opportunities to study metastable polymorphic forms.

Biography:

Dr. Asma Buanz is a research associate at the UCL School of Pharmacy, University College London (UCL), United Kingdom. She is a pharmacist by training; obtained her BSc.(Pharm) from the University of Benghazi, Libya. She holds an MSc in Drug Delivery from the School of Pharmacy, University of London and a PhD in Pharmaceutics from UCL. She is a member of the Royal Society of Chemistry and the Academy of Pharmaceutical Sciences. Her current work focuses on utilizing the application of inkjet printing for crystallising pharmaceutically related polymorphs as part of the project “Computationally Designed Templates for Exquisite Control of Polymorphic Form” funded by the Engineering and Physical Sciences Research Council (EPSRC) in collaboration with UCL Chemistry and University of Strathclyde. She is also part of the 3D printing research group at the UCL School of Pharmacy, which focuses on developing novel 3D printed dosage forms.