Meet
Dr David Beynon

David is a Research Officer based in the Welsh centre for Printing and Coating. Having completed a PhD researching ink transfer mechanisms in flexographic printing David's research interests have grown to include graphics, electronic and functional printed materials. Recent projects have included functional printed devices including electromagnetics, sensors and rheological characterisation of functional inks working in collaboration with academic and industrial partners. In his last position he worked with the EPSRC Centre for Innovative Manufacturing in Large-Area Electronics formulating functional inks for the ARPLAE and Flexipower projects and is now working on commercialisation.

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As an undergraduate in Chemistry I was involved in the formulation of light emitting polymers; however during my study, I always wondered what you do with these once they have been formulated, that is, how do you make use of these materials? This interest lead me lead me towards engineering and the Welsh Centre for Printing and Coating research group where I studied for a Masters degree in printing and coating technology which gave me a strong background in the many different technologies that come under the umbrella of printing. I followed this with an EPSRC funded PhD, examining ink transfer mechanisms in the flexographic printing process, which I completed in 2007. This grounding in the principles of scientific rigour and design of experiments where there are a great deal of interacting parameters has found me in good stead for future projects as a post-doctoral researcher where I have moved into the field of printed functional materials including printed sensors, printed motors and printed electromagnetics for advanced wound healing.

In late 2015 and into 2016 I had the opportunity to work for the Centre for Innovative Manufacturing in Large-Area Electronics formulating functional inks for the "ARPLAE" and "Flexipower" projects. ARPLAE (Advanced Rheology for Printing large-area electronics) is focussed on the application of the most advanced rheological measurement techniques to large-area electronic inks. Inks used for functional printing are complex fluids whose formulation is often dictated by the functional material they are carrying. The specific visco-elastic properties of an ink must be within the process-operating window, however the desire to load the ink with as much of the active material as possible can result in difficulties in both processing and printing.

My role on the ARPLAE project was to formulate model inks for the verification of the new advanced rheological techniques being developed; this is a challenging proposition as all the materials must be sourced from repeatable sources so that the exact same formulation can be produced through the lifetime of the project and into future projects and collaborations. The usual off-the-shelf solutions were not available and a minimum number of components was desirable, so modification of ink formulation through use of additives was ruled out. The formulation we developed contained only three components; polymer, active particles and solvent. With the modification of particle loading, the full operational window can be achieved. Combining print results with rheometric measurements has shown that the novel controlled stress parallel superposition (CSPS) technique offers superior performance as a predictor of print outcome. The ability to predict print performance means that this advanced technique is a valuable tool for informing and optimising formulation efficiently.

During my time working on the Centre's projects I have had the opportunity to work and network with different groups across the Centre at cohort meetings and other events. Being part of the same Centre creates opportunities for sharing information and collaboration between the four partner universities allowing for accelerated advancement of a number of projects. Through the Pathfinder project the Centre has given me the opportunity for career advancement through application for the SIMLIFT project as a co-investigator. Through this project I look forward to continue working with the Centre.