



Bristol – JILIN Symposium: October 2018

Abstract Submission Form

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Brief description of research activities:	
<p>We use real space analysis of model systems to understand basic properties of a wide range of materials. Our approach blends imaging of soft materials with computer simulation and combines the insights of both. Soft matter is epitomized by colloidal particles suspended in a liquid, which form models of atomic and molecular systems, because the particles follow the same laws of statistical mechanics. Crucially, our work applies not just to colloids but to atomic and molecular materials as well. This deep knowledge of the behavior of these materials allows us to optimize material properties by design.</p>	
Presentation title:	
Nano-Real Space Analysis: from Fundamental Science to Improved Devices	
Presentation abstract:	
<p>How do materials become solid? There are three routes: crystallisation, glass-formation and gelation. To fully understand the mechanism in each case, we need to understand the behavior of the constituent particles, and this we achieve by 3d imaging, now with STED nanoscopy. Gels are important in many products such as cosmetics and pesticides, and robustness of the gel network requires that the local structure is solid - locally it is a glass or crystal. We have revealed the mechanism by which gels – and glasses – and crystals become solid. This deep understanding of gelation then allows us to pinpoint applications where exploiting the mechanism of gelation allows improvement in product design and we illustrate this with photovoltaic cells.</p>	
Selected publications:	
<p>Hallett JE, Turci F and Royall CP, "Local structure in deeply supercooled liquids exhibits growing lengthscales and dynamical correlations", <i>Nature Communications</i> 9 3272 (2018).</p> <p>Williams I, Oguz EC, Speck T, Bartlett P, Loewen H and Royall CP "Transmission of torque at the nanoscale", <i>Nature Physics</i> 12 98–103 (2016).</p> <p>Taffs J and Royall CP, "The role of fivefold symmetry in suppressing crystallization" <i>Nature Communications</i> 7 13225 (2016).</p> <p><i>Complex Plasmas and Colloidal Dispersions: Particle-resolved Studies of Classical Liquids and Solids</i>, Ivlev A, Loewen, H, Morfill G and Royall CP. World Scientific. (2012).</p> <p>Royall CP, Williams SR, Ohtsuka, T and Tanaka H, "Direct observation of a local structural mechanism for dynamic arrest", <i>Nature Materials</i>, 7 556-561, (2008).</p>	