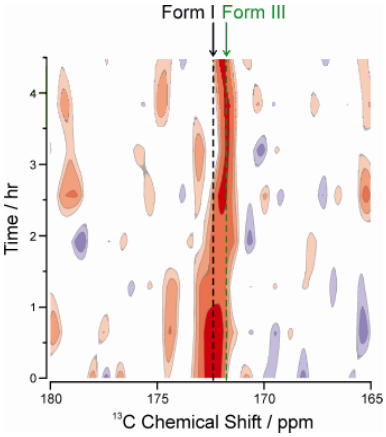
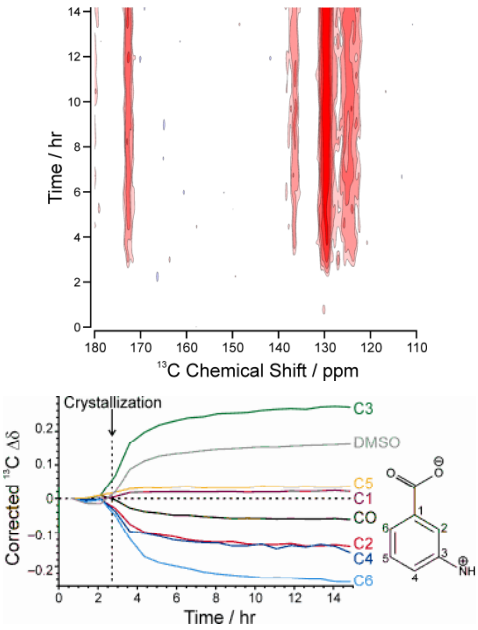
British Association for Crystal Growth Annual Conference - 2011

The British Association of Crystal Growth (BACG) encourages discussion of the theory and practice of crystal growth and crystallization on both national and international levels and since 1970 has held an annual conference to aid this. The 2011 BACG conference covered a wide range of topics in the field of crystal growth, ranging from nucleation and crystal surface structure during growth to pharmaceutical continuous crystallization processes, formation of co-crystals and ceramics. We presented a poster, "*In-Situ* NMR Studies of Crystallization using Combined Solution- and Solid-State NMR" by P. A. Williams, C. E. Hughes & K. D. M. Harris, on work undertaken at the UK 850 MHz Solid-State NMR Facility. CP-MAS ^{13}C solid-state NMR was used to investigate the crystallization of *m*-aminobenzoic acid (*m*-ABA) from solution in both methanol and dimethyl sulphoxide (DMSO). *m*-ABA is a pentamorphic system; two polymorphs were previously known (only one with a known crystal structure) and we have discovered and solved the structures of three more.

During each crystallization experiment, a small amount of solvent (~40 µl) was added to an excess of *m*-ABA (above the solubility at 20 °C) within a sealable NMR rotor. The rotor was placed within the spectrometer under MAS conditions and the temperature raised for several hours to allow for complete dissolution before reducing to 20 °C and starting a series of CP ^{13}C runs. When crystallization was attempted from methanol, instantaneous crystallization of *m*-ABA form I was observed, followed two hours later by a transformation to form III. This replicates experiments performed in the laboratory where *m*-ABA form I is produced by fast crystallization from methanol while slower crystallizations produce form III.



***In-situ* ^{13}C CP-MAS NMR study of crystallization of *m*-ABA from methanol.**



***In-situ* ^{13}C CP-MAS NMR and change in chemical shift of solution state peaks during crystallization of *m*-ABA from DMSO.**

A new method was performed during crystallization from DMSO. ^{13}C CP and direct excitation experiments were interleaved, allowing for study of both the solid and solution phases as crystallization occurs. From the CP, *m*-ABA form I can be observed crystallizing after two-hours. No transformation is detected during the rest of the 14-hour experiment. The solution-state NMR shows sudden changes in the chemical shifts of some peaks at the time crystallization is seen to occur in the solid-state spectra. This indicates that the changes in chemical shift are induced by the decreasing concentration of *m*-ABA caused by the ongoing crystal growth. By following the chemical shift changes backwards to their pre-crystallization values, it may be possible to infer associations within solution during nucleation. Use of the 850 MHz spectrometer was essential to increase sensitivity, allowing sufficient time resolution during the *in-situ* studies.