

50 years of D11

A history of SANS
at the ILL



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50 years ago, polymers were well established materials, but there were a number of crucial questions open to relate molecular to material properties. It was already 50 years since Herman Staudinger had proposed that plastics were composed of long chain molecules and 20 years since Paul J. Flory described long chain molecules as random walks where dimensions increase as the square root of mass. Both of these won Nobel prizes for their work and it was accepted that the material properties of plastics such as elasticity and viscoelasticity were determined by their long chain nature. However no direct experimental evidence for Staudinger and Flory had been observed. It was understood that small angle scattering would provide the link if a labelling technique were available. Given the large content of hydrogen, deuteration would be ideal if SANS instruments could provide a high enough count rate. Enter D11 and in 1973 the random walk nature of a single polymer molecule in a melt was demonstrated by several groups. Rapidly afterwards SANS experiments showed many other examples of the molecular basis for plastic behaviour such as the deformation and then relaxation of molecules in stretched samples.

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