**Synthesis of well-defined biodegradable polymers and study of their materials properties**

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Poly(vinyl alcohol) (PVA) is an important commodity polymer which is used extensively in the production of adhesives and protective films, and for biomedical applications. In contrast to other olefin-derived polymers, PVA is biodegradable through metabolism by *Pseudomonas* sp.,3 making it an attractive material for further commercial exploitation. PVA is prepared by the alkaline hydrolysis of poly(vinyl acetate) (PVAc), synthesized industrially by radical polymerization. Such methods offer little scope for engineering the molecular characteristics of the resultant polymers, with poor control over molecular weights and dispersity within the population.

Here, we will use reversible-deactivation radical polymerization (RDRP) techniques to produce well-defined PVAc/PVA materials, and study their structural and dynamic properties using a range of scattering techniques (Scheme). Deuterated analogues of PVAc and PVA will also be produced via this route, allowing us to study interdiffusion within polymer films by ion and neutron scattering techniques. The influence of chain-end functionality, and the inclusion of other monomer units through (block) copolymerization, will be explored with a view to making new biodegradable materials of higher mechanical strength, improved solubility or enhanced rheological properties, thus expanding the scope of the applications of PVA-based materials.



**Training**

The student will receive extensive training in synthetic polymer chemistry, gaining experience in RDRP techniques which are of broad application, and an area of intense research focus within the polymer chemistry community. The student will also develop considerable expertise in the characterization of soft matter, employing a range of techniques such as NMR spectroscopy, size-exclusion chromatography, small-angle x-ray and neutron scattering, quasi-elastic neutron scattering and neutron reflection. There are several excellent training courses provided by the central neutron scattering facilities and the student would benefit from joining a research group with several experienced users of these facilities. Few scientists have acquired these complementary skillsets, and the project will equip the student with a range of transferable technical skills, applicable within academic and industrial research. We propose to work in partnership with P&G Belgium, offering the student the opportunity to engage with industry from an early stage in their career.