Molecular insights into industrial polymers from solid-state NMR spectroscopy: from food to adhesives

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Résumé

Solid-state NMR is invaluable for the molecular characterisation of polymeric materials. It is commonly used to elucidate chemical composition, and can also reveal other important molecular attributes.
Starch is the main component of food staples such as rice, wheat and potato. To help develop new varieties, the breeders and growers and are looking for tools to predict quality traits such as texture and digestibility. The relationship between the molecular mobility in rice grains and their digestibility was investigated through $T2$ relaxation.

Hot-melt adhesives are a repair tool of choice for damaged conveyor belts on mining sites, a demanding application in terms of adhesive and mechanical properties. To aid the development of new generations of adhesives, quantitative 13C NMR at high-temperature allowed quantification of the composition, while 2D WIdeline SEparation (WISE) allowed probing for heterogeneity. The relationships between $T2$ relaxation and the mechanical (Young modulus) or adhesive (peel strength) properties were investigated.

Reference:
Advanced spectroscopy, microscopy, diffraction and thermal analysis of polyamide adhesives and prediction of their functional properties with solid-state NMR spectroscopy. KA Bhullar, A Meinel, K Maeder, R Wuhrer, M Gaborieau*, P Castignolles, Polymer Chemistry, in press, DOI: 10.1039/D0PY01348J (2021).

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