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## Exploring Hydration Mechanisms in Poly(N-isobutyramide) and its Isomer, Poly(N-isopropylacrylamide).

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Stimuli-responsive polymers hold a prominent position in the field of functional materials due to their remarkable adaptability to changing environmental conditions. Among these, thermo-responsive polymers have gained attention due to the easy access to the temperature parameter. This study investigate Poly(N-isobutyramide) (PNVIBAM) and compare it with its structural isomer, Poly(N-isopropylacrylamide) (PNIPAM). Notably, PNVIBAM exhibits a slightly higher Lower Critical Solution Temperature (LCST) than PNIPAM in aqueous solutions. This makes PNVIBAM particularly well-suited for applications requiring temperature sensitivity to the human body, such as controlled drug delivery. We investigate the swelling behavior of both polymers when employed as thin films and exposed to high humidity conditions. To assess their swelling characteristics, we employ Spectral Reflectance (SR) techniques, providing insights into how they respond to water vapor exposure and to learn about their swelling capacity. Additionally, *in situ* Fourier-Transform Infrared Spectroscopy (FTIR) is used to explore the hydration mechanisms in both polymers. Furthermore, Neutron Reflectometry (NR) offers crucial insights into their equilibrium swollen state and water content. This research contributes to the understanding of PNVIBAM and PNIPAM properties regarding their hydrophilic behaviour.

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