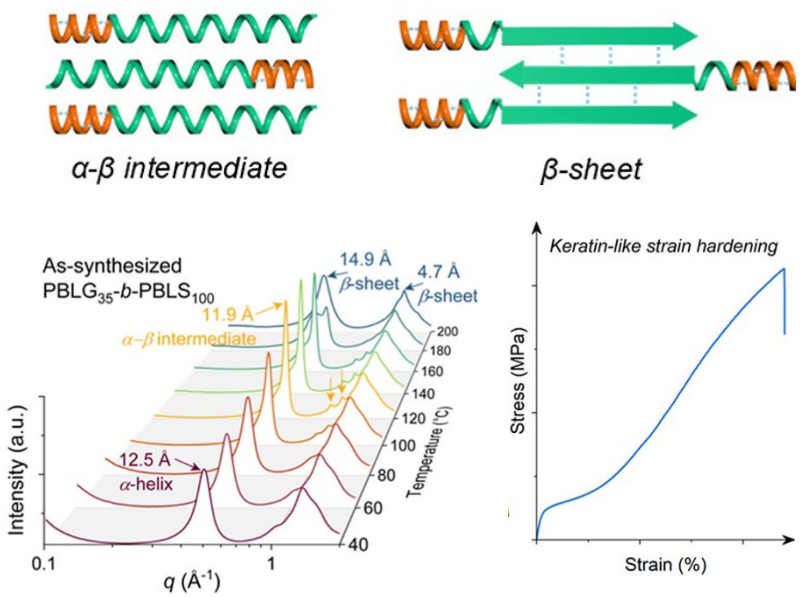
Learning from Nature to Make Stronger Synthetic Polypeptides



(Top) Stretched synthetic copolypeptides with Transformable PBLS or PBLC Segments. (Bottom) In situ WAXD of $PBLG_{35}$-b-$PBLS_{100}$ upon heating shows the α-to-β structural transition with temperature. The transition results in dramatic strain hardening.

T. Yang, J. Mao, T. Xue, S. Wu, R. Li, Y. Chen, A.A. Sitab, J. Cheng, Y. Lin. "Intermediate States Enable Keratin-like α-to-β Transformations in Strain-Responsive Synthetic Polypeptides." *J. Am. Chem. Soc.* **2025**, 147, 18, 15534–15544.

Work was performed in part at NSLS-II

Scientific Achievement

Scientists have developed synthetic polypeptides that mimic the α-to-β structural transitions of fibrous proteins from nature, achieving strain-induced mechanical reinforcement at high temperatures.

Significance and Impact

This approach offers a new strategy for creating thermally robust, responsive, bioinspired materials.

Research Details

- Polypeptide chains were synthesized that can transition from α-helix to a strong β-sheet form under heat and mechanical strain.
- In situ synchrotron X-ray scattering confirmed that chain alignment, β-sheet formation, and domain growth occur stepwise during deformation.

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