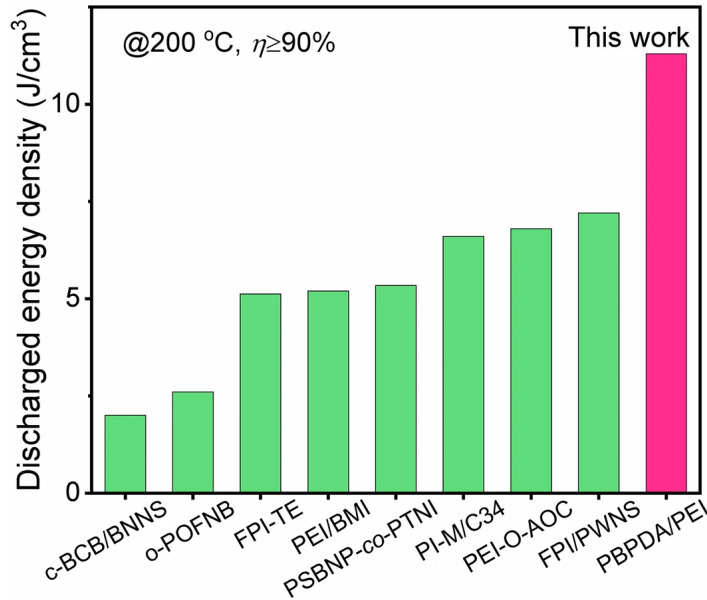


Polymer enables low-loss energy storage at high temperatures



The energy storage performance of a new PBPDA/PEI blend containing equal amounts of each material (50/50 by weight) at a charge/discharge efficiency of 90% at 200°C compared with the current leading polymer and composite materials reported in previous studies.

Li, L., Rui, G., Zhu, W., Guo, Y., Huang, Z., Wu, S., Casalini, R., Wang, Q., Liu, Z., Colby, R. H., Kim, S. H., Lu, W., Bernholc, J., Zhang, Q.M. Giant energy storage and dielectric performance in all-polymer nanocomposites. *Nature* **651**, 377–382 (2026). <https://doi.org/10.1038/s41586-026-10195-2>

Work was performed in part at NSLS-II

Scientific Achievement

By combining two polymers, researchers create a plastic-based dielectric material that stores large amounts of energy with very little loss, even at temperatures as high as 250°C.

Significance and Impact

This new material could enable smaller, lighter, and more reliable capacitors for high-temperature applications like hybrid vehicles and aerospace electrification.

Research Details

- Without adding any inorganic particles, the self-assembled structures yielded ultrahigh dielectric responses ($K > 13$) and low loss.
- WAXD at the CMS beamline at NSLS-II helped characterize the structural order of the polymer blend, playing a significant role in energy storage.
- WAXD and SAXS measurements at CMS also demonstrated that self-assembly and interfacial interactions enhance crystallinity and structural ordering in the blend.



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