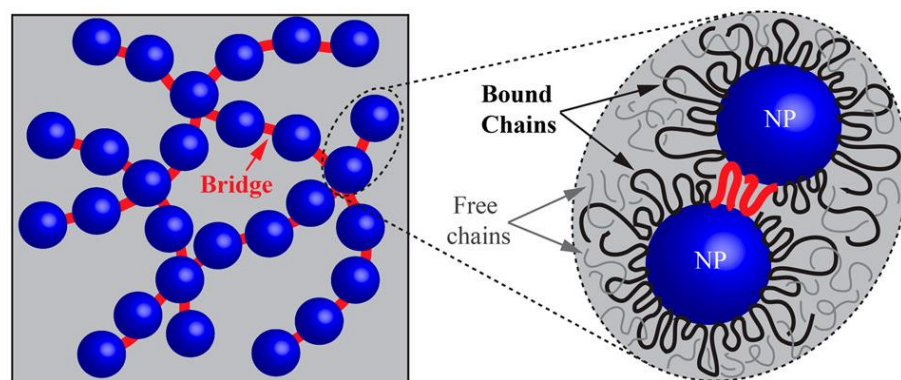


Building Bridges for Reinforcing Polymers



This image illustrates how the network-like structure of nanoparticles (NP) is formed via polymer bridges (red) within a nanocomposite (PNC) (left). The zoomed-in image (right) shows that these bridges are composed of polymer chains bound to NP surfaces, serving as effectively permanent bonds.

B. M. Yavitt, D. Salatto, Y. Zhou, Z. Huang, M. Endoh, L. Wiegart, V. Bocharova, A. E. Ribbe, A. P. Sokolov, K. S. Schweizer, T. Koga. *ACS Nano* **15** (7), 11501-11513 (2021).

Work was performed in part at Brookhaven National Laboratory

Scientific Achievement

Scientists revealed how a network of nanoparticles tightly bonded by polymer bridges controls the mechanical properties of polymer nanocomposites (PNCs).

Significance and Impact

Understanding the microscopic structural and dynamical features of the bridge network in polymers, and how they relate to the polymer's behavior, e.g., its toughness, can help guide polymer design for future applications such as tires and wind turbine blades.

Research Details

- Used the CHX and CMS beamlines at NSLS-II to study the structure and dynamics of the network-like structure of PNCs.
- Used the dynamical mode-coupling theory to understand the observed NP dynamics.
- Used mechanical tests at the CFN to establish the structure-dynamics-property relationship.