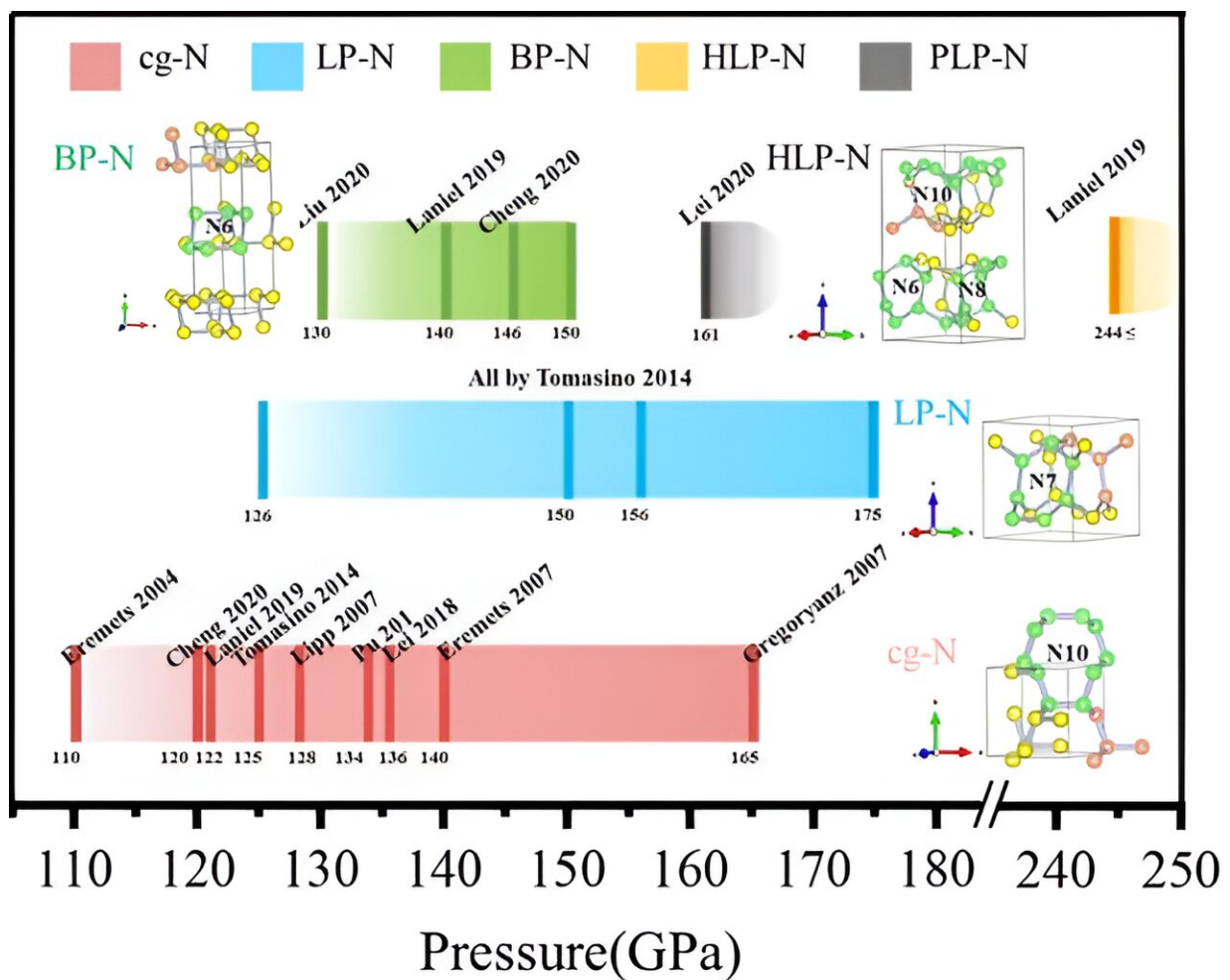


Scientists use large scientific facilities to test the synthesis and characterization of polymeric nitrogen

December 12 2023



The history and characteristics of polymeric nitrogen synthesized hitherto.
Credit: Li Lei, et al

Polymeric nitrogen (PN), formed under high temperature and pressure conditions, is considered an ideal high energy density material (HEDM). Its application prospects extend beyond the field of energetic materials, showing significant relevance in the field of fundamental physics.

The 20th century witnessed the complex behavior of [nitrogen's high-pressure](#) phase. The advent of large scientific installations and advanced spectroscopy techniques has also furthered our understanding of this topic.

In a review published in the journal *Energetic Materials Frontiers*, a group of researchers from China outline the studies of the [synthesis](#), structural properties and lattice dynamics of polymeric nitrogen based on large scientific facilities and spectroscopic perspectives under extreme conditions.

Their review of the studies conducted through scientific facilities and spectroscopic methods under extreme conditions, shed light on various synthesized forms of polymeric nitrogen. Notable among these are cubic gauche nitrogen (cg-N), layered polymeric nitrogen (LP-N), hexagonal layered polymeric nitrogen (HLP-N), post-layered-polymeric nitrogen (PLP-N), and black phosphorous structure nitrogen (BP-N).

The authors also discuss the synthesis methods, characterization techniques, current challenges and structural similarities, presenting Raman criteria for each.

"The study of PN has achieved some gratifying results, but there are still many problems to be solved," noted the authors. "First, the progress in the technology of thermodynamic synthesis conditions is necessary to identify and probe the evolution and phase diagram of PNs. Second, the

comprehensive understanding of synthesized products needs advances in various diagnostic methods."

"Moreover, the bandgap of PN at high pressure has not been investigated experimentally until now, which is a promising direction for studying the high-pressure electronic band structure of PN," they added.

More information: Li Lei et al, Polymeric nitrogen: A review of experimental synthesis method, structure properties and lattice dynamic characterization from large scientific facilities and extreme spectroscopy perspectives, *Energetic Materials Frontiers* (2023). [DOI: 10.1016/j.enmf.2023.09.005](https://doi.org/10.1016/j.enmf.2023.09.005)

Provided by KeAi Communications Co.

Citation: Scientists use large scientific facilities to test the synthesis and characterization of polymeric nitrogen (2023, December 12) retrieved 27 April 2024 from <https://phys.org/news/2023-12-scientists-large-scientific-facilities-synthesis.html>

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