Hyperuniformity

Source: PIB

Researchers have explored the mechanism behind the **emerging property of** a recently discovered **exotic disordered state of matter,** known as “hyperuniformity”.

- **About Hyperuniformity:** It is a property of certain **heterogeneous media where long-wavelength density fluctuations decay to zero.**
  - Hyperuniform disordered materials are observed in quasicrystals, large-scale cosmic structures, **biological emulsions, and** colloids.
- **Mechanism Behind Hyperuniformity:**
  - In hyperuniform systems, suppressed **density fluctuations result from a conservation law that limits particle mobility**, explaining the reduced mass fluctuations as system size grows.
- **Comparison to Critical Point of Liquids:**
  - Hyperuniform matter **contrasts with liquid critical points**, where mass fluctuations diverge and cause critical opalescence.
  - In hyperuniform matter, **mass fluctuations are suppressed, positioning it between a crystal, amorphous solid, and liquid.**
- **Potential Applications of Hyperuniform Materials:**
  - Hyperuniform materials have unique properties with potential technological and biological applications, including **energy-efficient photonic devices for data transmission and controlling cellular functions.**

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