

## Competitive structural and electronic states under pressure

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Application of high pressure has profound effects on both structural and electronic stabilities of a material. In the vicinity of such instabilities, new states of matter often appear which may compete or co-exist. Exploring materials near phase instabilities provides access to rich physics and opportunity to discover exotic new states of matter. I will present some of our recent studies on exploring competitive states of materials at extreme conditions and discuss two distinct examples of our recent studies on pressure-induced structural and electronic transitions in materials: the coexistence of vitreous and crystalline phases of H<sub>2</sub>O at ambient temperature detected via complementary XRD and Raman studies<sup>1</sup> and interplay between the CDW and superconducting states in 2D material BaSbTe<sub>2.1</sub>S<sub>0.9</sub> under pressure.

<sup>1</sup> Shargh, A. K., A. Picard, R. Hrubik, D. Zhang, R. J. Hemley, S. Deemyad, N. Abdolrahim, and S. Saffarian. "Coexistence of vitreous and crystalline phases of H<sub>2</sub>O at ambient temperature." *Proceedings of the National Academy of Sciences* 119, no. 27 (2022)

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