

# Novel materials discovery under extremely high pressure

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Pressure is regarded as an entirely new dimension of science, which enables us to explore much broader range of thermo-mechanical conditions by accessing extreme states of matter. High-pressure research has been predicted to ultimately even leads to the establishment of a new periodic table, one which has the same elements but completely redefined physical and chemical behaviors at megabar pressures; Li and Na are not well-behaving metals anymore and they become insulators [1], solid oxygen becomes metallic and even turns into superconducting phases [2]. In this presentation, I will introduce recent discoveries in high-pressure physics including room-temperature superconductivity in hydrides [3], and novel oxidation state of iron oxides in deep lower mantle conditions [4]. I will conclude my talk by suggesting possible collaborations of high-pressure research with other extreme conditions.

[1] *Nature* **458** 186-189 (2009), *Nature* **458** 182-185 (2009)

[2] *Phys. Rev. Lett.* **74** 4690 (1995), *Nature* **393** 767-769 (1998)

[3] *Phys. Rev. Lett.* **122** 027001 (2019), *Nature* **569** 528-531 (2019), *Nature* **586** 373-377 (2020)

[4] *Nature* **534** 241-244 (2016), *Nature* **551** 494-497 (2017), *Nature Geoscience* **14** 174-178 (2021)