

Noblest of all metals is structurally unstable at high pressure

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The uniqueness of gold and its appreciation as a valuable material throughout history is closely related to its exceptional stability to chemical reactions and extreme pressures and temperatures. Because of its chemical, mechanical and electrical properties, gold is considered the noblest of all metals. Gold has been known to remain stable in a cubic crystalline phase from ambient conditions up to 180 GPa (one million eight hundred thousand atmosphere!). Due to its large pressure and temperature stabilities, the cubic phase of gold is currently used as a pressure calibrant in high-pressure and high-temperature experiments at pressures above 100 GPa. A possible structural phase transformation would place a "natural" limit on the application of cubic gold as a calibrant in high-pressure and high-temperature experiments.

In this talk, I will address the problem of phase stability of gold under extreme conditions.

We demonstrate using theoretical and experimental results that the noblest of all metals is structurally unstable at high pressure. I will show that gold undergoes a phase transformation to an hexagonal structure induced by high pressure.