学术报告

题　目： **Transition Metal Compounds in Extreme Environments**

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报告摘要：

Transition metals (TM) with partially-filled d electron shells form a series of compounds with a uniquely wide range of electronic, magnetic, elastic, and thermodynamic properties. These compounds can have a plethora of implications in electronics, semiconductors, optical switches, resistors, magnetic devices, superconductors, to name a few. The discovery of 2-dimensional (2D) mono-layered and multi-layered TM dichalcogenides (TMDs), such as MoS_2, opens the window for technological impacts of 2D TMDs including intelligent clothing, medical diagnostics, energy harvesters, tunable materials, energy storage, personal care, and flexible electronics. These TMDs are comprised of stacked quasi-two-dimensional sheets of metal atoms covalently bonded with two sheets of chalcogen atoms above and below them. It has recently been found that there is a whole host of 2D materials with interesting and special properties. Studying the electronic, magnetic, elastic, vibrational, and structural properties of 2D/3D TM compounds in extreme pressures and temperatures is thus of great research interest in materials science and condensed matter physics. As a result of the partially-filled *d* electronic orbitals, however, the TM compounds can exhibit complex behaviors that are challenging to unveil.

Here I will present recent research results on TM compounds using magnetite, “122” iron pnictides, and 2D MoS_2 as examples to illustrate the interplays between their electronic, magnetic, and structural properties at high pressures and low temperatures. I will use these examples to highlight recent technical advances in synchrotron-based inelastic X-ray scattering and laser spectroscopies coupled with diamond anvil cells that have offered a plethora of research opportunities at extreme P-T environments. These studies unleash new insights into phonon dispersion curves, phonon density of states, electronic structures (e.g., spin and valence states), magnetism, elasticity, metallization and band gaps, as well as bonding characters of the representative TM compounds. Implications in materials science and condensed matter physics as well as future challenges and research opportunities will also be addressed so as to stimulate participating scientists in the community to explore this new frontier research in TM compounds collaboratively.

报告人简介：

林俊孚博士于 2002 年获得美国芝加哥大学的博士学位，2002-2008 年先后在美国华盛顿卡内基研究院地球物理实验室、Lawrence Livermore 国家实验室等国际著名实验室从事科学研究工作，至今已发表文章 60 余篇，其中在 Nature、Science、PRL、PNAS 等国际著名期刊上有十多篇。他主要在地球内部及行星科学研究方面，利用先进的同步辐射光源和金刚石对顶砧实验技术在极端高温高压条件下对物性进行研究，并对地球内部环境提出新构想，在地球科学研究领域产生了重要影响。

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