Pressure-Induced Phase Transitions in \( \text{Ca}_{n+1}\text{Ru}_n\text{O}_{3n+1} \) (n=1,2) and \( \text{TiSe}_2 \):
Raman Spectroscopic Studies

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We have developed a new system capable of making inelastic light scattering measurements simultaneously at high-pressures (100 kbar), low-temperatures (3.2K), and in a magnetic field (8T). We present results from the ruthenates and \( \text{TiSe}_2 \), a CDW material. The ruthenate, \( \text{Ca}_3\text{Ru}_2\text{O}_7 \), undergoes a metal-insulator transition at 56K and a paramagnetic-antiferromagnetic transition at 48K at atmospheric pressure. Our results reveal a pressure-induced decrease in the metal-insulator transition all the way down to a T=0 phase transition, with a concomitant decrease and eventual destruction of the antiferromagnetic state. The results on the bi-layered \( \text{Ca}_3\text{Ru}_2\text{O}_7 \) are compared to the single layered \( \text{Ca}_2\text{RuO}_4 \), where 5 kbar drives the system into a metallic state while higher pressures reveal a coexistence of ferromagnetism and antiferromagnetism. \( \text{TiSe}_2 \) develops a commensurate Charge Density Wave (CDW) below 200K at atmospheric pressure and our preliminary results show the destruction of the CDW insulating state at 3.5K at a pressure of 20 kbar.