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Discovery and Characterization of the S02 Meteorite from the Jonnagiri Area, Andhra Pradesh, India.

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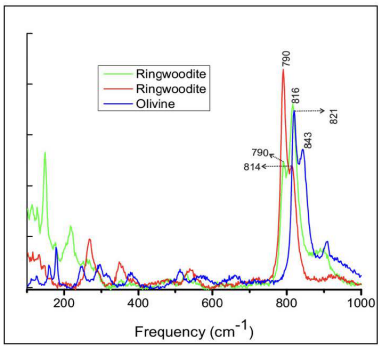
A recent find of a stony meteorite, designated S02, has been reported from the Jonnagiri area in Andhra Pradesh, India. The sample weighs approximately 0.075 kg and measures around 5 cm in length. It displays characteristic regmaglypts with minute depressions on its surface and exhibits a magnetic property. Detailed analytical investigations have been conducted using several techniques, including Powder X-ray Diffraction (PXRD), Energy Dispersive X-ray Fluorescence (EDXRF), SEM, Raman and basic petrological studies. Microscopic examination revealed the presence of primary minerals such as Fayalite/olivine, titanite, NiS, cobalt, and CuS. The Raman spectra obtained of olivine grains within shock veins of the meteorite indicate presence of both olivine (doublet with spectra at 820 and 843 cm^{-1}) and, its high pressure polymorph Ringwoodite, with the chemical formula $(Mg,Fe)_2SiO_4$ (doublet with spectra at 790 cm^{-1} and 814/816 cm^{-1}).(Fig 1). Ringwoodite, is particularly significant due to its high-pressure stability. The inversion of doublet of Ringwoodite (Fig. 1) may be a manifestation of lattice scale deformation, probably during its transition to olivine/fayalite. The electron microprobe analysis of the meteorite confirms the presence of iron-rich olivine (fayalite), which has undergone alteration to ringwoodite under high pressure. Experimental data suggest that ringwoodite and Wadsleyite can coexist at pressures between 16.5 and 17.5 GPa (approximately 495–525 km depth) at 1285 °C, and between 17.7 and 18.7 GPa (approximately 531–560 km depth) at 1470 °C. The presence of **water** in the meteorite was also identified via Raman spectroscopy, which revealed a "hump" at **3200 cm-1,** indicating **O-H stretching vibrations** typical of water molecules. This suggests that the meteorite contains water, offering fresh insights into the **amount of water stored** in the Earth's mantle.The discovery of water, in combination with the ringwoodite, provides crucial information that may aid in understanding the **conditions of Earth's mantle** and potentially impact the **debate on the ascent velocity of diamond-bearing kimberlite magmas**.As Jonnagiri area has reports of Carbanado occurences. This could help refine models of how diamonds travel from deep within the Earth to the surface, contributing to broader studies on mantle dynamics and volcanic processes.



Fig,1 Raman Spectra of Olivine and Ringwoodite