HIGH-PRESSURE STRUCTURAL STUDIES AND THE MAGNETIC PROPERTIES OF Sr_2CuOsO_6

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Compression mechanisms in a newly synthesized osmium-containing oxide were characterized with ambient and high-pressure synchrotron X-ray diffraction. The magnetic susceptibility of Sr_2CuOsO_6 was measured using a SQUID magnetometer. The results were consistent with an assignment of Cu(II)-Os(VI) formal oxidation states. Using synchrotron X-ray powder diffraction, we refined the crystal structure using the Rietveld method, and the resulting refinements indicate complete B-cation order in a double perovskite crystal structure. The analysis of B-cation bond lengths indicates a symmetric coordination around Os, as opposed to significant distortion of Cu-O bond lengths. The octahedral distortion around Cu(II) is characteristic of a Jahn-Teller distortion. Within the crystal structure of Sr_2CuOsO_6, the long Cu-O bonds are aligned in the same direction along the *c*-axis in the tetragonal unit cell. This parallel arrangement of long Cu-O bonds produces a lattice parameter ratio, $c/(2^{1/2}a)$, that is greater than unity. In perovskites, octahedral tilting and bond shortening are two competing compression mechanisms. Application of hydrostatic pressure up to 6 GPa significantly decreased the lattice parameter ratio, demonstrating the primary compression mechanism is a shortening of the long Cu-O bond.