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Type I antiferromagnetic order in Ba₂LuReO₆: Exploring the role of structural distortions in double perovskites containing 5d² ions

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Abstract

The structural, electrical, and magnetic properties of the double perovskite Ba₂LuReO₆ have been examined. It is an insulator whose temperature dependent conductivity is consistent with variable range hopping electrical transport. A transition to an antiferromagnet state with type I order occurs below $T_N = 31$ K. High resolution time-of-flight neutron powder diffraction measurements show that it retains the cubic double perovskite structure down to 10 K. High intensity, low resolution neutron powder diffraction measurements confirm the antiferromagnetic order and indicate that cubic symmetry is still observed at 1.5 K. The small ordered moment of 0.34(4) μ_B per Re is comparable to estimates of moments on 5d² ions in other antiferromagnetically ordered cubic double perovskites. Comparisons with related double perovskites containing 5d² ions, such as Os⁶⁺ and Re⁵⁺, reveal that subtle changes in structure or

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