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Magnetically driven metal-insulator transition in $NaOsO_3$[1] STUART CALDER, VASILE GARLEA, ORNL, DESMOND MCMORROW, UCL, MARK LUMSDEN, MATHEW STONE, ORNL, JONATHAN LANG, JONG-WOO KIM, JOHN SCHLUETER, ANL, YOUGUO SHI, CAS, YING SUN, YOSHIRA TSUJIMOTO, KAZUNARIA YAMAURA, NIMS, ANDREW CHRISTIANSON, ORNL —
The metal-insulator transition (MIT) is one of the most dramatic manifestations of electron correlations in materials, enjoying interest both for its fundamental nature and technological application. Various mechanisms producing MITs have been extensively considered over the years associated with the names of their originators, including most especially Mott (electron localization through Coulomb repulsion) and Anderson (localization through disorder). An alternative route due to Slater dating back to 1951, in which long-range magnetic order in a three dimensional system drives the MIT, has received relatively little attention, particularly from an experimental viewpoint. Using neutron and X-ray scattering we have shown that the MIT in $NaOsO_3$ is coincident with the onset of long-range commensurate three dimensional magnetic order at 410 K. $NaOsO_3$ thus encompasses all of the expected features of the long predicted Slater transition. Our results are the first definitive experimental example of a Slater MIT and we discuss them in the light of recent reports of a Mott spin-orbit insulating state in other $5d$ oxides.

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Stuart Calder
Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831, USA.

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