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Superconductivity and New Compounds in the Bi-O-S System
DAVID WALLACE, KATHRYN ARPINO, W. ADAM PHELAN, KEN LIVI, The Johns Hopkins University, CHE SEABORNE, ANDREW SCOTT, University of Leeds, TYREL MCQUEEN, The Johns Hopkins University — Recent reports of superconductivity in $Bi_4O_4S_3$ and $LaO_{1-x}F_xBiS_2$ have stimulated interest in a potentially new family of layered superconductors based on BiS_2 units. The most interesting structural feature of the reported crystal structure of $Bi_4O_4S_3$ is that it contains both reduced sulfides (S^{2-}) and oxidized sulfates (S^{6+}) within the same compound. However, the scattering factors of oxygen and sulfur relative to bismuth make the precise structure of $Bi_4O_4S_3$ difficult to determine by x-ray diffraction, and limit the ability to compare with theoretical predictions of electronically driven structural distortions. Here we report the results of studies on the structure and physical properties of compounds in the Bi-O-S system through electron diffraction, high resolution transmission electron microscopy, synchrotron x-ray diffraction, and IR spectroscopy, including the discovery of two new ternary Bi-O-S phases.

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