イルメナイト型 $CuVO_3$ の新奇な電子軌道状態

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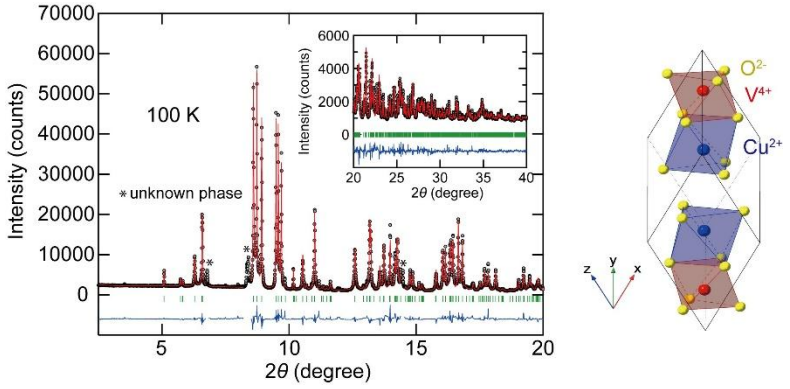
Novel electronic orbital states in ilmenite-type $CuVO_3$ ([1]*Tohoku University,* [2]*Hiroshima University,* [3]*QST,* [3]*JAEA*) ○Hajime Yamamoto,[1] Keigo Ochi,[1] Takuya Aoyama,[2,1] Kenya Ohgushi,[1] Kenji Ishii,[3] Daiju Matsumura,[4] Takuya Tsuji,[4] Tadashi Abukawa[4]

Most ilmenite-type vanadium oxides, $A^{2+}V^{4+}O_3$ (A = Mg, Mn, Co, Ni, and Zn), exhibit a V-V dimerization phenomenon below 400-550 K, which results from the formation of covalent bonds between the neighboring vanadium ions. Ilmenite-type $CuVO_3$ can also be synthesized under high-pressure (HP) and high-temperature conditions, however, the intrinsic physical properties and electronic states of $CuVO_3$ have not been revealed due to the difficulty in synthesizing high-quality samples caused by oxygen deficiency. In this study, we prepared the high-quality $CuVO_3$ sample using the HP synthesis method and conducted the crystal structure refinement (Figure) and various physical property evaluations. From the results, we discover the 3*d* orbital order and spin-liquid states of the Cu^{2+}, as well as the potential orbital (V-V dimer) liquid state of the V^{4+} in this compound.

Keywords : copper; vanadium; oxide; spin; orbital

多くのイルメナイト型バナジウム酸化物 $A^{2+}V^{4+}O_3$（A = Mg, Mn, Co, Ni, Zn）では、隣接する V イオン間に共有結合が形成されることで、およそ 400-550 K 以下の温度で V－V 二量体の形成が起こる[1)]。一方で $CuVO_3$ では、酸素欠損に起因した良質な試料の合成の困難さから、本質的な物性や電子状態を評価されていなかった[2)]。本研究では、超高圧合成法を用いて良質なイルメナイト型 $CuVO_3$ の作製を行い、結晶構造解析（図）と電子状態評価、各種の物性測定を行った。これらの実験から、Cu^{2+}の 3d 電子軌道秩序とスピン液体状態、V^{4+}の軌道液体状態の可能性を発見したので報告する。



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