Comments on the paper "Studies of structural, dielectric, conductivity, leakage current mechanism, and efficiency of complex electroceramic"

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Abstract

The commented paper claims the preparation of a new compound, $Bi_{1/2}Li_{1/2}Fe_{1/2}W_{1/2}O_3$. By this commentary, we showed that erroneous experimental evidence was provided for such claims. We demonstrated that the main phase in the commented paper was Bi_2WO_6.

Keywords: perovskites; doped $BiFeO_3$; X-ray diffraction; phase analysis; lattice parameters; errors

The $BiFeO_3$ perovskite and its derivatives continue to attract a lot of attention of researchers worldwide. S. S. Hota et al. have recently claimed the preparation of a new heavily-doped $BiFeO_3$-related compound with a chemical composition of "$Bi_{1/2}Li_{1/2}Fe_{1/2}W_{1/2}O_3$" (BLFWO) [1]. BLFWO was prepared using a conventional solid-state method from a stoichiometric mixture of Li_2CO_3, $FeCO_3$, WO_3, and Bi_2O_3 in air at 1053 K for 4 h and at 1023 K for 4 h. An X-ray powder diffraction pattern of BLFWO could be indexed by the authors with lattice parameters of a = 10.0096 Å, b = 9.9673 Å, c = 7.5531 Å, and β = 110.64°. Therefore, the authors of Ref. [1] concluded that a new single-phase compound was prepared, and space group $P2_1$ was assigned to BLFWO.

However, we found that the majority of observed reflections on the reported X-ray powder diffraction pattern of BLFWO (Figure 1a of this commentary) could be explained by a known phase, Bi_2WO_6 (Figure 1b). Reflections from Fe_2O_3 and Li_2WO_4 could also be seen on the reported X-ray powder diffraction pattern of BLFWO; other weak reflections could not be identified. Therefore, a situation with BLFWO resembles a situation with another similar compound, "$Bi_{1/2}K_{1/2}Fe_{1/2}W_{1/2}O_3$", claimed by the same authors [2]. It was shown that "$Bi_{1/2}K_{1/2}Fe_{1/2}W_{1/2}O_3$" does not exist, and a mixture of Bi_2WO_6, K_2WO_4, and Fe_2O_3 was investigated instead [3].

Therefore, a mixture of (partly) known phases was investigated in Ref. [1] instead of a new compound, "$Bi_{1/2}Li_{1/2}Fe_{1/2}W_{1/2}O_3$". The authors of Ref. [1] did not perform any standard phase-analysis procedures, assumed that a single-phase compound was obtained, and moved to indexing attempts resulting in erroneous claims.

References

[1] S. S. Hota, D. Panda, R. N. P. Choudhary, Studies of structural, dielectric, conductivity, leakage current mechanism, and efficiency of complex electroceramic. Ceram. Int. 50 (2024) 4031–4045.

[2] S. S. Hota, D. Panda, R. N. P. Choudhary, Fabrication and physical characteristics of K/W double doped $BiFeO_3$ complex electro-ceramic; $(Bi_{1/2}K_{1/2})(Fe_{1/2}W_{1/2})O_3$. J. Alloys Compd. 976 (2024) 172900. doi: 10.1016/j.jallcom.2023.172900

[3] A. A. Belik, Comments on the paper "Fabrication and physical characteristics of K/W double doped $BiFeO_3$ complex electro-ceramic; $(Bi_{1/2}K_{1/2})(Fe_{1/2}W_{1/2})O_3$". J. Alloys Compd. 977 (2024) 173434. doi: 10.1016/j.jallcom.2024.173434

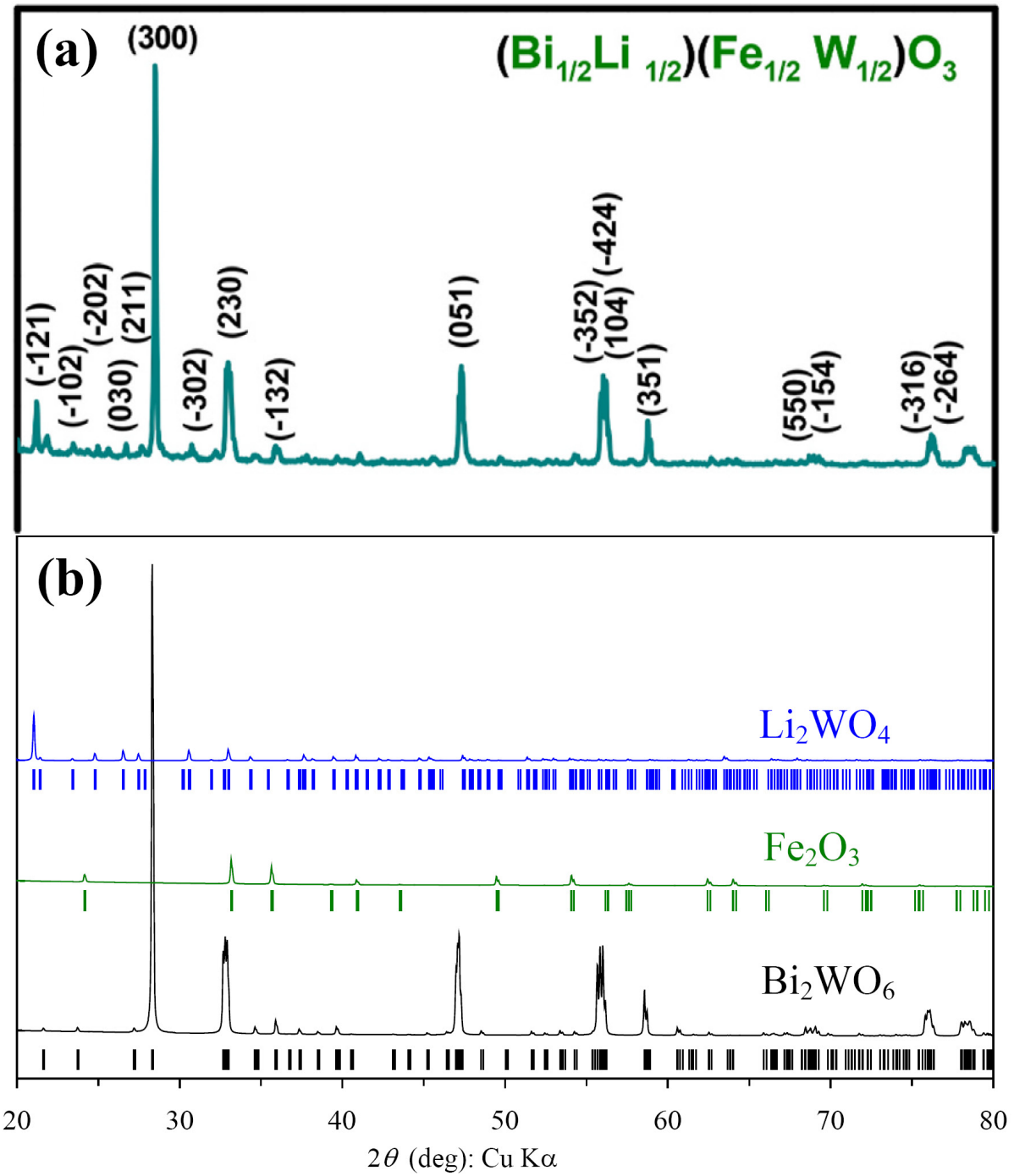

Figure 1. (a) An experimental X-ray powder diffraction pattern of a "$Bi_{1/2}Li_{1/2}Fe_{1/2}W_{1/2}O_3$" sample from Figure 1a of Ref. [1]. (b) Calculated X-ray diffraction patterns of Bi_2WO_6 (the black curve and the black tick marks for possible Bragg reflection positions; International Center for Diffraction Data (ICDD) Powder Diffraction File (PDF) record 73-2020), Fe_2O_3 (the green curve and the green tick marks; PDF 33-0664), and Li_2WO_4 (the blue curve and the blue tick marks; PDF 79-2006). The calculated patterns (intensity ratios) correspond to a 1:1 molar mixture of Bi_2WO_6 and Fe_2O_3 [3]. Figure 1a is reproduced with the permission from Elsevier.