

Crystalline structure and magnetic properties of pyrite FeS₂

Cite as: AIP Advances 11, 015131 (2021); doi: 10.1063/9.0000110
Presented: 3 November 2020 • Submitted: 25 October 2020 •
Accepted: 17 December 2020 • Published Online: 21 January 2021



View Online



Export Citation



CrossMark

Hyunkyung Choi,¹  Jae Yeon Seo,¹ Young Rang Uhm,² Gwang Min Sun,² and Chul Sung Kim^{1,a)} 

AFFILIATIONS

¹Department of Physics, Kookmin University, Seoul 02707, South Korea

²HANARO Operation and Utilization, Korea Atomic Energy Research Institute, Daejeon 34057, South Korea

Note: This paper was presented at the 65th Annual Conference on Magnetism and Magnetic Materials.

^{a)}Author to whom correspondence should be addressed: cskim@kookmin.ac.kr

ABSTRACT

Iron pyrite (FeS₂) has attracted significant attention as a promising inorganic material in various applications, such as electrode materials for high-energy batteries, medical diagnostics, semiconductor materials, and photovoltaic solar cells. In this study, we characterized the crystalline structure and magnetic properties of FeS₂ using X-ray diffraction (XRD), vibrating sample magnetometry, and Mössbauer spectroscopy. The refined XRD patterns confirmed that the crystalline structure of FeS₂ was cubic (*Pa*-3 space group) with lattice constant $a_0 = 5.417$ Å. The temperature dependence of the zero-field-cooled and field-cooled curves and the hysteresis loops were measured at various temperatures between 4.2 and 295 K. The Mössbauer spectra collected in the temperature range of 4.2–500 K were fitted with one doublet. The ΔE_Q values increased slightly with decreasing temperature owing to changes in the Fe–S distance. The charge state was determined to be Fe²⁺ based on the isomer shift (δ).

© 2021 Author(s). All article content, except where otherwise noted, is licensed under a Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>). <https://doi.org/10.1063/9.0000110>