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CuFeO₂ formation using fused deposition modeling 3D printing and sintering technique

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CuFeO₂ is a metal oxide mineral material which is called delafossite. It can potentially be used as a chemical catalyst, and gas sensing material. There are methods to fabricate CuFeO₂ such as chemical synthesis, sintering, sputtering, and chemical vapor deposition. In our work, CuFeO₂ is prepared by Fused Deposition Modeling (FDM) 3D printer. The composite filament which composed of Cu and Fe elements is printed in 3 dimensions, and then sintered and annealed at high temperature to obtain CuFeO₂. Suitable polymer blend and maximum percent volume of metal powder are studied. When percent volume of metal powder is increased, melt flow rate of polymer blend is also increased. The most suitable printing condition is reported and the properties of CuFeO₂ are observed by scanning electron microscopy, and dynamic scanning calorimeter, X-ray diffraction. As a new method to produce semiconductor, this technique has a potential to allow any scientist or students to design and print a catalyst or sensing material by the most conventional 3D printing machine which is commonly used around the world.

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