

Materials Science & Engineering

Master's Defense

Electrochemical and Photoelectrochemical Properties of the
Copper Hydroxyphosphate Mineral Libethenite

School for Engineering of Matter, Transport and Energy

Man Li

Advisor: Dr. Candace Chan

abstract

There has been much interest in photoelectrochemical conversion of solar energy in recent years due to its potential for low-cost, sustainable and renewable production of fuels. Despite the huge potential, there are still a number of technical barriers due to the many constraints needed in order to drive photoelectrochemical reactions such as overall water splitting and the identification of efficient and effective semiconductor materials. To this end, the search for novel semiconductors that can act as light absorbers is still needed. *Libethenite* has been recently shown to be active for photocatalytic degradation of methylene blue under UV-irradiation, indicating that photo-excited electrons and holes can effectively be generated and separated in this material. However, $\text{Cu}_2(\text{OH})\text{PO}_4$ (CHP) has not been well studied and many of the fundamental materials and photoelectrochemical properties are still unknown. In this work, we explored the synthesis of different morphologies of copper hydroxyphosphate (CHP) by hydrothermal synthesis and precipitation method. We also have conducted a preliminary investigation of the relevant fundamental characteristics such as the bandgap, flatband potential, band structure, electrochemical and photoelectrochemical properties for CHP. Better understanding of this material may lead to the development of improved catalysts and photocatalysts from natural sources.



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