✓Poster□ Oral

Synthesis of $Zn_2Mo_3O_8$ by Ceramic and Pechini methods and determination of optical and electronic properties

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The world energy needs are growing and the photovoltaic energy appears as a good alternative to fossil fuels because the sun is a source of energy inexhaustible at human scale, clean, free and available in large quantities.Although silicon-based solar cells are the most common at the industrial scale, they suffer of some drawbacks like the production costs and the amount of manufacturing waste[1]. Thus, many materials such as CdTe, CiGS or GaAs are studied in thin layers to achieve high photoconversion efficiencies in solar cells while facilitating the production, limiting the manufacturing wastes and costs and diversifying their application. However, these materials are composed of toxic or rare-earth elements. In a dynamic search of new materials based on abundant and low-toxic metals, we explore the interest of condensed molybdenum cluster oxides $A_2Mo_3O_8$ as absorber layers for all oxide solar cells built on a p-n junction.

$A_2Mo_3O_8$ phases have a layered structure consisting of alternating layers of condensed triangular Mo_3 clusters and layers with occupied tetrahedral and octahedral cationic sites[2], which confer on them promising optical and electronic properties for PV applications. Indeed, the $Zn_2Mo_3O_8$ phase is an unintentionally doped n-type semiconductor that has an indirect bandgap[2] of 1.55 eVand an electron mobility[3] of 0.6–0.7 cm^2/V^{-s}, comparable to the CdTe phase.

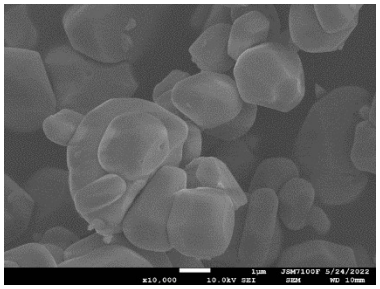

Figure 1 : SEM image of $Zn_2Mo_3O_8$ powder synthesized by ceramic route

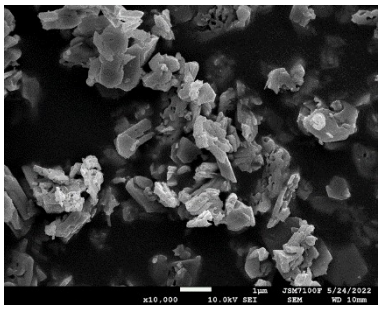

Figure 2 : SEM image of $Zn_2Mo_3O_8$ powder synthesized by Pechini route

Thus, we investigated the synthesis strategies of the $Zn_2Mo_3O_8$ phase in order to obtain layers with various microstructural morphologies. Two methods of synthesis were studied: the classical high-temperature ceramic route[3]and the never reported polymeric precursor method based on Pechini process[4]. This presentation will be focused on the comparison between the obtained powders in order to rationalize the impact of the synthesis route on the structural, microstructural, and optoelectronic properties of $Zn_2Mo_3O_8$.

References

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