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Abstract
The most common methods used in laboratories for preparing thin CuInSe2 (CIS) films on glass substrate are sputtering and molecular beam epitaxy (MBE) which requires high temperature (200℃ ~600℃) process. However, it"s difficulties for used on plastic substrate, due to the drawback of a high-temperature process. Furthermore developed lightweight and flexible CIS plastic solar cells are interesting for terrestrial application. Therefore a low-temperature process developed on flexible CIS-based solar cells becomes very important.

In this thesis, we made preparations for the CIS thin film directly on plastic substrate under low-temperature (25℃) process by means of electrodeposition (ED) technique. The detailed investigation of the growth technique and film quality for the ED-CIS film is presented.

Based on the experimental results, CIS thin film has been co-deposited on Au coated plastic substrate from an aqueous acidic solution containing 1 mM CuCl2, 5 mM InCl3 and 1 mM SeO2 adjusted to pH = 1.65. The film qualities can be improved by adding complexing and buffer agents in the bath and annealing them under N2 atmosphere. During the process, the reduction of Cu ions and the effect of hydrogen evolution can be suppressed via TEA and Na-Citrate, respectively. The optimal ED-CIS thin film is obtained from the growth solution containing 1M TEA and 0.1 M Na-citrate at the -1.5 V (SCE) after annealing for 1 hr under N2 atmosphere. The composition ratio of the annealed film was “25.57% Cu, 25.01% In and 49.42% Se”. The energy gap of ED-CIS film was about 1.18 eV. Various characterizations such as EDS, XRD, SEM, UV/VIS, FTIR and PEC show that the ED-CIS thin film can be successfully and suitably grown on a flexible CIS-based solar cell.
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