Fabrication of an artificial leaf for solar-fuel production

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Due to the concerns about fossil fuel shortage and environmental issues related with global warming the interest in renewable energy resources is rapidly increased in recent years. Solar energy may be an ultimate solution for future energy problem because it is massive and inexhaustible. In order to convert solar energy to usable energy carriers various techniques have been suggested. Among them, solar light can lead to conversion of carbon dioxide to hydrocarbon via photoelectrochemical devices, very similar to photosynthesis by leaves in nature. In this study we introduce a device for solar-fuel production in which photovoltaic (PV) and catalyst techniques are combined into one single system. For the realization of this architecture, a precursor solution based high voltage generating CuInxGa1-xS2 (CIGS) thin film solar cell and its module were fabricated to be used as a PV photoelectrode. In addition, low temperature coating method of Co3O4 catalytic film was developed to install an electrocatalytic layer on the reverse side of the photoelectrode for efficient water splitting. The details of the synthetic method and characterization of solution processed CIGS thin films and the solar-fuel generation system will be discussed in the presentation.