A highly versatile artificial leaf employing unique characteristics for application in various nature environments

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Solar energy is a sustainable energy on earth but it is so diffusive. Therefore, it should be converted into storable energies like H_2 from solar water splitting. Nowadays, photo-electrolysis combined with photovoltaic (PV) cell has received great attention as an efficient non-biased water splitting system for solar fuel conversion. Not only for high efficiency, its various designs have been studied for convenient and practical usage. In this research, The PV-electrolysis system has been developed as a floatable and planar-compact artificial leaf with unique configuration. The series cell was combined with a 2D-designed electrodes deposited on one face of counter glass substrate, where free air space is adjustable between two substrates. This space enables the module floatable in water-abundant condition, giving several merits like maximizing light absorption without absorption loss by water layer. Also, the 2D-designed single-face electrodes make the water splitting reaction occur on one surface, allowing the device to operate in water-scarce condition like shallow water. Combining these characteristics, our module could be highly adaptive to functioning in various environments.