Dye sensitized solar cells using natural dyes derived from *Chaetomorpha, Microcladia borealis, Elisolandia elongate* and sea lettuce

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Natural dye-sensitized solar cells (DSSCs) are a promising area in renewable energy. These innovative devices employ natural dyes extracted from plants to absorb sunlight and convert it into electricity. The dyes (anthocyanins in berries or chlorophyll in green plants), act as sensitizers, absorbing sunlight and generating excited electrons. One of the significant advantages of natural DSSCs is their eco-friendly nature, as they utilize renewable resources and have a low environmental impact compared to traditional solar cells. Moreover, their production is cost-effective and can be easily scaled up for industrial applications. With ongoing R&D efforts, natural DSSCs have the potential to contribute significantly to a cleaner and sustainable energy future. Reinforcing above, this study investigated the efficiencies of DSSCs produced using dyes of novel seaweed varieties (*Microcladia borealis, Ellisolendia elongata, sea lettuce* and *Chaetomorpha*) from shallow seas in Sri Lanka. Dye extracts from sea weeds have been studied sparsely with DSSCs. This research dives into the extensive color resources contained in the Sri Lankan seaweeds. The absorption of the dye and the electron emitting efficiency of the dye showed a clear relationship which can be further used in research for better dyes without following the full procedure of producing the cell. Additionally, the research opens a path for further research whether nano TiO_2 is a mandatory factor in producing a DSSC. The highest efficiency was shown by dye extracted from Microcladia borealis which was $1.7x10^{-5}$ %.

Keywords: Seaweed, DSSC, extraction method, conversion efficiency, natural dye