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Using Microalgae for Converting Solar Energy into Biofuels and other Bio-products

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It is consensual that current patterns of energy consumption and usage are unsustainable in the medium to long term, as mankind still has an overwhelming dependence on fossil fuels. Various renewable energy systems are being studied, developed and implemented, with the main goals of reducing the dependence on fossil fuels, decreasing the environmental impacts, increasing energy supply and security, among other purposes. Solar energy is one of the key renewable energy forms, either directly, as for example through photovoltaic energy, either indirectly, through the growth of biomass. Concerning the later form, among the various options, microalgae are currently seen as one of the best choices, showing a strong potential to be relevant in a future bio-based economy. Some key advantages are: their high productivity and low growth requirements, potential feedstock for next-generation biofuels, and rich source of high-value compounds with a wide range of applications, such as in nutraceutical, pharmaceutical, food industries and as protein for animal feed, among others. However, the development and commercial deployment of microalgae-based products is still very limited, due in part to technological and economic barriers that need to be overcome. In particular, the selection of the algal species or strain to be used as the primary source of raw materials is a fundamental step, as the design of the biomass cultivation and downstream processing and production system is strongly dependent on the characteristics of the microalgae that are being cultivated. On the other hand, the choice of the downstream processes to be used are dependent on the microalgae characteristics and products to be recovered. In order to increase the microalgae biofuels competitiveness, the high value bio-products need to be also recovered from biomass following a biorefinery process. This work aims to analyze the current state of development of microalgae biorefineries, giving examples of potential microalgae, showing how they can contribute to convert solar energy not just to biofuels but also to other bio-products.