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USE OF SINGLE-CELL OILS IN THE PRODUCTION OF BIO-BASED EPOXY: AN OVERVIEW OF THE MOST SUITABLE MICROORGANISMS AND OIL PROPERTIES

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Abstract – Epoxy resins are widely used polymers that are mainly synthesized from fossil feedstocks. In order to reduce the use of fossil-derived epoxies, various solutions are widely studied, such as replacing conventional raw materials with more environmentally friendly, non-toxic solutions, such as vegetable oil. One of the less studied but potentially highly competitive feedstock for the synthesis of bio-based epoxies is single-cell oils (SCO). Single-cell oils have a number of advantages over vegetable oils, such as the fatty acid profiles of SCO are more suitable for the polymerization of epoxides, the production of SCOs is faster and more environmentally friendly. Thanks to the wide range of SCO-producing microorganisms, it is possible to find the exact SCO that is suitable for the specific application of the produced epoxy. Despite the potential advantages, SCO derived from microorganisms such as yeasts, fungi and bacteria, have received very limited coverage in the scientific literature. Therefore, this review summarizes the available information on single-cell oils and evaluates their suitability for use as feedstock in epoxide synthesis. The following aspects are reviewed in this paper: microorganism strains that can be used in the production of SCO; fermentation rates and SCO yields; applicable low-cost raw materials used for the cultivation of microorganisms; the fatty acid profile of the relevant SCO and other factors that are significant for suitability evaluation of the relevant SCO. To the best of authors knowledge this is the first review paper to summarize potential SCOs for their application in synthesis of bio-based epoxides and first paper to give an overview of fungal and bacterial oils for such application.

Keywords – *Bio-based epoxy; bio-based polymers; bioresource management; single cell oil; microbial oil; oleaginous microorganisms*