

HYDROTHERMAL CONVERSION OF MICRO-ALGAE AS NEW BIOMATERIALS FOR PAVEMENT

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Bitumen is a non-renewable petroleum-derived product whose market is under pressure due to the fossil fuel depletion and the environmental pollution concerns. It is therefore important to anticipate the replacement of this material, heavy fraction of petroleum distillation, used mostly in road construction as a matrix of an aggregate composite material. In that context, it is necessary to look for alternatives or substitution products and find processes that can valorize new renewable biomasses.

Scenedesmus and Spirulina residues, coming from a first industrial valorization, have been identified as a potential biomass for this application as well as hydrothermal liquefaction (HTL), which is a promising organic solvent-free thermochemical process able to convert those residues into a viscous liquid fraction.

For each microalgae residue, an hydrophobic material was recovered after HTL. This bio-crude has been characterized by different analytical techniques (GCxGC-MS, NMR, GPC, FT-IR, elemental analysis...). Then, the rheological behavior of those oils was measured and compared to a petroleum bitumen. One residue showed a rheological behavior similar to a petroleum-based bitumen while the other microalgae residue presented a viscoelastic behavior similar to a bio-sourced binder loaded with a high percentage of elastomers. We studied as well the influence of the HTL conditions (addition of a catalyst, temperature, reactor loading...) on the bio-crude chemical composition and rheological behavior.



Figure 1 – Hydrothermal liquefaction of microalgae residues into bioasphalt