Proceedings of the 7th World Congress on New Technologies (NewTech'21)
~~Prague, Czech Republic~~ Virtual Conference – August, 2021
Paper No. ICEPR 302
DOI: 10.11159/icepr21.302

Waste Water Treatment with Biomicrogel®

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Extended Abstract

Microgels are polymer colloid particles with diameter less than 1 micron that can swell in water [1]. Micro- and nanoparticles developed from biopolymers are preferable over synthetic polymers due to their biocompatibility and have been used in green technologies for wastewater treatment. The formation of microgel particles in polysaccharide solutions enhances their emulsifying properties. In general, colloidal particles act in many ways like surfactant molecules, particularly if adsorbed to the interface of emulsion droplets. However, important differences exist between the solid particles and soft microgels, due to the fact that after swelling in water, they contain only 3% of dry matter, which makes their use highly cost-efficient.

Due to its small size under the influence of thermodynamic factors, microgels concentrate on phase boundaries, for example, emulsion droplets. The structure and charge of the surface do not have a decisive influence on the deposition efficiency of microgels on surfaces. Microgels also have no effect on the magnitude of the surface tension at the boundary of the two phases. The microgels of the polysaccharides are deposited on the drops of the oil-in-water emulsion, and then when the metal ions are added, the drops stick together in large flakes and fall out of solution. Thus, microgels can be used as an effective reagent for breaking emulsions at low concentrations [2].

Our research program is focused on the modification of biopolymers in aqueous suspensions and production of commercially available microgels for wastewater treatment under trade mark Biomicrogel®. Microgels are obtained from natural raw materials, for example industrial food waste, such as beet pulp. They are non-toxic and do not contain substances that can contaminate environment. The new production technology in our company allows us to obtain microgels of polysaccharides with minimal input of energy and resources [3,4].

In this presentation we will demonstrate examples of highly polluted water treatment in the metal and oil industry. A good example is cooling liquids from rolling mill, which can be regenerated using pectin-based microgels with high efficiency. While the initial concentration of oil in water exceeds 500 mg per liter, after treatment with Biomicrogel®, it decreases to 1 mg or less. Another example is the produced water formed during oil production with concentration of oil 200 – 1500 mg per liter. It can be successfully purified using cellulose-based Biomicrogel® to a final oil content of 4 - 10 mg per liter. This allows the reuse of this water in the oil field. In summary, Biomicrogel® are promising products for cleaning highly polluted water and oil-in-water emulsions.

References

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