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RHEOLOGICAL, THERMAL AND MECHANICAL CHARACTERIZATIONS OF POLYOLEFIN-ALGAE COMPOUNDS

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Chlorella is a kind of micro algae consisting of a single cell and belonging to the green algae family. This single cell contains all the organs that are necessary for its reproduction such as genes, chloroplast, mitochondria and cell membrane. Since “naturally grown” chlorella cannot be commercialized, the technology for cultivating chlorella in the outside man made pool was developed and the commercial scale production was started in Japan during the 1950s. Results showed that it can also be cultivated even in the absence of light. At present Chlorella is mainly ingested as a food supplement, concerning medicinal properties and health care. Thinkable applications of such organic filler in polymer engineering are the biological fixing of CO2 and the possibility of making polymers biodegradable. This biodegradability for example appears at a concentration of ca. 40 weight percent algae. The main questions here are the basic applicability of this bio filler in polymers and the influence onto the mechanical, thermal and rheological properties of the polymer matrix. The used algae are produced by ethanol extraction of spray dried cultured biomass. Afterwards, this organic alga is compounded with different concentrations of blended base and modified polymers using a co-rotating twin screw extruder. The interaction of chlorella grains with the polymer matrix is thereby considerably enhanced by the chemical grafting of the polymer with maleic anhydride. In this work, the influence of various amounts (20, 30 and 40 wt%) of organic algae onto the polymer matrix is characterized. The mechanical, rheological and thermal differences of the compounds are investigated by tensile test, dynamic-mechanical analysis and differential scanning calorimetry. The formation of chemical bonds between chlorella grains and polymer matrix is the decisive factor for the compound properties. This effect is characterized by infrared spectroscopy and scanning electron microscopy.