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Cellulose nanocomposite for food packaging application

Packaging has become one of the most attractive topics in recent years. To solve environmental problems related to using petroleum-based packaging materials, bioplastics are gaining increased attention because they are renewable and biodegradable. However, weak mechanical properties, high gas/water permeability and poor stability during processing of bioplastics in comparison with non-biodegradable materials have limited their application. There are different methods to enhance these properties among which the addition of nanomaterials especially cellulose nanofibers is the most effective method. These days, Poly butylene succinate (PBS) and thermoplastic starch (TPS) have attracted much attention among bioplastics. The goal of this project is making biodegradable nanocomposite films for packaging application with good barrier properties. PBS has good transparency and mechanical properties as well as good resistance to Water but high cost. We blend PBS with starch for 3 main reasons: increase in biobased content, increase in biodegradation rate, and reducing the price. Starch is cheap, non-toxic, abundant, and biodegradable but it is hard to process and shows low barrier and mechanical properties. To overcome the processing problem, we can add plasticizer like Glycerol to the blend that cause to reduction in water resistance. Now, the role of nanofiller like nanocellulose to enhance the thermal, mechanical and barrier properties get important. By adding nanocellulose due to increasing the tortuosity path in the nanocomposite or the interaction between nanocellulose and polymer matrix due to good dispersion, the water solubility and water vapor permeability is expected to decrease.