

JOINT EVENT ON

5th International Conference on Bioplastics and 6th World Congress on Biopolymers

September 07-09, 2017 | Paris, France

Thermoplastic starch-based films

Rangrong Yoksan, Nattaporn Khanonkon and Khanh Minh Dang
Kasetsart University, Thailand

Recently, the materials produced from renewable resources, particularly plants, have been received much attention due to their sustainability, biodegradability, non-toxicity, being environmentally friendly, etc. Starch is one of the naturally abundant polysaccharides found in various types of agricultural crops such as potato, corn, rice, pea, including cassava. The properties of starch depend on their sources and compositions, especially a weight fraction of linear amylose and branched amylopectin polymers. In general, amylopectin provides semi-crystalline structure to starch granules. Crystallinity of starch can be destroyed by the processes called gelatinization, in the presence of excess amount of water, and plasticization. For the latter, starch is converted into thermoplastic material, i.e. thermoplastic starch (TPS), by incorporating plasticizer under applying heat and shear. Although TPS possesses good gas barrier property and mainly produced from starch, which is cheap, non-toxic, naturally abundant, renewable, biodegradable and compostable, its high water/moisture absorption, which causes poor mechanical and barrier properties, limits its utilization. Blending TPS with other more hydrophobic polymers, such as poly(lactic acid) (PLA), polyethylene (PE), chitosan, etc. is an alternative to improve the properties of TPS and to widen its utilization. Some examples for improving the performances of TPS are discussed in the presentation. Incorporating chitosan into TPS film through blown film extrusion is an interesting technique to produce edible film due to less energy and time consumption as compared with the solution casting method. Chitosan could improve both tensile and barrier properties of TPS film. Blending TPS with PLA is also one of our goals to obtain the completely bio-based and biodegradable material for packaging applications including plastic bags, film and wrap, with competitive cost as compared with neat PLA. The obtained PLA/TPS blends possessed better blown film processability and greater extensibility than PLA film. To reduce the use of petroleum-based plastics, TPS is possibly blended with PE; however, the phase separation between these two polymers has to be overcome. Starch stearate (ST-SA) was used as a compatibilizer for the PE/TPS blend. Tensile properties of the PE/TPS blend were improved by incorporating ST-SA (Figure 1) with the reduced TPS phase size and the better TPS phase distribution throughout the film matrix.

rangrong.y@ku.ac.th