Development of polymeric sustainable materials using nanotechnology

Luiz Henrique Capparelli Mattoso[1], Caio Gomide Otoni[1], Marcos Vinicius Lorevice[1], Francys Kley Vieira Moreira[1], José Manoel Marconcini[1], Cauê Ribeiro Oliveira[1]

[1]Embrapa Instrumentação

e-mail: luiz.mattoso@embrapa.br

Environmentally inspired strategies have been explored throughout the last decades aiming at developing sustainable alternatives to replace petroleum-based non-biodegradable materials. Our group has been investigating several natural polymers (e.g., pectin, starch, and cellulose derivatives) as well as organic and inorganic nanoreinforcements (e.g., chitosan nanospheres, cellulose whiskers, and layered clays) to produce bio-based materials with improved thermal and mechanical performances. Edible films, for instance, have been studied to provide novel edible food packaging without any health concern to consumers, while also being biodegradable and obtained from renewable sources. We have been investigating fruit purees (e.g., mango, guava, papaya, and banana) to develop innovative edible bioplastic films with unique color and flavor. Additionally, nanotechnology concepts have been applied on edible films as an effort to make them reach the physical-mechanical properties of synthetic polymers used in food packaging. Previous studies on chitosan nanoparticles and cellulose whiskers were conducted in that regard. Antimicrobial substances (e.g., plant essential oils and their active compounds) have also been incorporated to provide the edible films with antimicrobial properties to extend food shelf life and ensure food safety. This lecture will also cover the production of new bionanocomposites from multifunctional nanoparticles and their future outlooks of application in sustainable technologies.

Acknowledgements Embrapa, FINEP/MCT, CNPq, and FAPESP (Process n° 2010/11584-5, n° 2012/21867-0, n° 2012/24362-6, n° 2013/14366-7, and n° 2014/23098-9).