Reza Ahmadi et al., J Nanomater Mol Nanotechnol 2018, Volume 7
DOI: 10.4172/2324-8777-C7-038

Biobased nylons from Canola oil

Reza Ahmadi, Muhammad Arshad and **Aman Ullah***
University of Alberta, Canada

The synthesis of renewable, sustainable, and environment-friendly polymeric biomaterials has got more attention during the last decade. On the other hand, microwave-assisted organic synthesis has become an extremely attractive synthetic tool at the same time due to its distinctive advantages such as shorter reaction times, higher yields, and limited generation of by-products as well as relatively easy scale-up without detrimental effects. Nevertheless, the use of microwave technology in biomaterials science has been relatively few. Therefore, the synthesis of novel, bio-based polyamides from dimethyl 9-octadecenedioate derived from Canola oil and diethylenetriamine as well as p-xylene diamine using 1,5,7-Triazabicyclo[4.4.0]dec-5-ene (TBD) as an organic catalyst was studied under microwave irradiation. First, cross-metathesis of fatty acid methyl esters (FAMEs) from Canola oils was carried out using a microwave reactor in solvent-free conditions to get highly pure dimethyl 9-octadecenedioate (diester). Then, condensation polymerization of diester and diamines as monomers was performed using classical heating and microwave irradiation methods. The resulted polyamides were characterized and analyzed using proton nuclear magnetic resonance spectroscopy (1H-NMR), attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR), differential scanning calorimetry (DSC), thermal gravimetric analysis (TGA), size exclusion chromatography (SEC) and tensile tests. Finally, the beneficial effect of microwave irradiation on the acceleration of the polycondensation of monomers is highlighted. The high molecular bio-based polyamides have the great future potential to be used in different applications as a substitute of petroleum-based polyamides.

ahmadi1@ualberta.ca

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