

Studi degradasi PP (grade boopp film) dengan perlakuan multiple extrusion terhadap pertumbuhan gugus karbonil menggunakan fourier transform infra red spectroscopy (FTIR) = Study of PP degradation (bopp film grade) with multiple extrusion treatment toward carbonyl groups growth using fourier transform infra red spectroscopy (FTIR)

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Abstrak

Perkembangan industri polimer di dunia terus meningkat. Yang menjadi persoalan pelik bagi dunia plastik adalah sulitnya untuk didaur ulang dan sangat mudahnya terdegradasi. Industri polimer sering menghasilkan sisa raw material yang akan didaur ulang. Tetapi, recycling memiliki dampak degradasi yang cukup signifikan bagi material daur ulang, terutama ketahanannya terhadap thermal degradation. Oleh sebab itu, studi mengenai kemampuan plastik bertahan dari degradasi terus dilakukan. Dengan harapan ditemukan sebuah batasan dan definisi yang dinamis dari pengolahan berulang (recycled) plastik dan dampak degradasinya. Resin PP Trilene Homopolymer BOPP (Biaxially Oriented) Film grade HF 2.9 BO yang biasa digunakan untuk flexible packaging makanan, snack, adhesive tape, dan pearlized film dicampur kering dengan beberapa jenis antioksidan (diberi kode A, B, dan C) sebanyak 2000 ppm dan calcium stearate Palmstar 300 ppm. Dilakukan multiple extrusion sebanyak lima kali. Parameter pengujian ini adalah ekstrusi 1, 3, dan 5. Kemudian dilakukan pengujian MFR (Melt Flow Rate), YI (Yellowness Index), mechanical properties (tensile, fleksural, impak izod, dan kekerasan), dan FTIR (Fourier Transform Infra Red) untuk mengukur indeks karbonil. Dari hasil pengujian didapat kenaikan MFR dan YI; stabilitas nilai sifat mekanik PP; dan kenaikan indeks karbonil. Kenaikan nilai MFR dan YI menunjukkan terjadinya degradasi. Stabilitas nilai sifat mekanik disebabkan performa antioksidan ditambah degradasi masih berada pada tahap induksi, di mana oksidasi PP masih belum optimal. Mechanical properties akan menurun akibat PP terdegradasi, tetapi baru akan terlihat signifikan apabila memasuki fase degradasi pada waktu tertentu. Kenaikan indeks karbonil menunjukkan terjadi degradasi, ini dapat dipelajari dengan FTIR spektroskopi. PP sisa raw material dapat didaur ulang dengan sifat mekanik yang masih baik.

<hr><i>Polymer industry around the world is increasing over the year. The problem is plastics are hard to recycle and easily degrades by UV, thermal degradation, etc. polymer industry also always produced raw material residue that will be recycled. However, recycling polymer have major impacts to recycled material, particularly its endurance from thermal degradation. Therefore, study about plastics resistance ability become necessary and need to be developed. With expectation that limitation and dynamic definition to recycled plastics processing and its degradation impacts, will be found. PP resin Trilene Homopolymer BOPP (Biaxially Oriented) Film grade HF 2.9 BO which usually used for food flexible packaging, snack, adhesive tape, and pearlized film dry mixed with amount of anti-oxidants (code A, B, and C) as much as 2000 ppm and 300 ppm calcium stearate Palmstar. The specimens has been treated with multiple extrusion about five times. This testing parameters is the 1st, 3rd, and 5th extrusion. Next, is the testing for MFR (Melt Flow Rate), YI (Yellowness Index), mechanical properties (tensile, flexural, impact izod, and hardness), and FTIR (Fourier Transform Infra Red) to measure carbonyl index. Among the results of the experiments are increasing value of MFR and YI during multiple extrusion; stability in mechanical

properties; and increasing of carbonyl index. The rising of MFR and YI values showed a degradation. The stability in mechanical properties is caused by anti-oxidants performance and the degradation which is still at induction period. Mechanical properties will decrease while PP is degraded, but will be clearly obviously when it comes the degradation stage for a specific time. The increasing of carbonyl index shows that the degradation occur, it could be studied with FTIR spectroscopy. PP raw material residue can be recycled by the next extrusion and still have quite good mechanical properties.</i>