

Studi awal peningkatan skala produksi bioplastik berbasis pati ubi jalar/clay menggunakan teknik film casting = Preliminary study on the scale up of sweet potato starch/clay based bioplastic production using film casting method

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Abstrak

Peningkatan produksi dan konsumsi plastik konvensional yang signifikan beberapa dekade terakhir telah menyebabkan masalah serius terhadap lingkungan berupa sampah plastik yang non-degradable.

Pengembangan plastik biodegradable menjadi solusi menarik dalam upaya penanggulangan masalah tersebut. Pada penelitian ini, studi awal peningkatan skala produksi bioplastik berbasis pati ubi jalar dengan pengisi 9% bentonite clay dilakukan pada rangkaian alat sonikator-tangki berpengaduk menggunakan teknik film casting. Penggabungan sonikator dan tangki berpengaduk dengan impeller tipe paddle diaplikasikan guna mendapatkan proses pembuatan bioplastik yang efektif.

Dari studi awal peningkatan skala produksi ini diperoleh sebanyak 21 film bioplastik per batch produksi dengan kondisi operasi proses pemanasan dan pengadukan pada suhu 85°C selama 70 menit. Hasil karakterisasi kuat tarik dan elongasi bioplastik dibandingkan skala laboratorium, masing-masing 41,65 kgf/cm² dan 40,22 kgf/cm² serta 26,42 % dan 5,17% sedangkan nilai transmisi uap air yakni 3,95 g/m²/jam dan 7,85 g/m²/jam. Interaksi matriks dan filler serta kandungan amilosa pati menjadi faktor yang mempengaruhi sifat mekanis dan fisis bioplastik. Hal ini dikonfirmasi melalui hasil analisis SEM, FT-IR, XRD, dan UV-vis. Berdasarkan karakterisasi yang ada, peningkatan skala produksi bioplastik dapat dilakukan menggunakan rangkaian alat sonikator-tangki berpengaduk.

.....The significant increase in the consumption and production of conventional plastics in recent decades has caused serious problems to the environment in the form of plastic waste that is non-degradable. The development of biodegradable plastics has become an attractive solution in eradicating the problem. In this work, preliminary study to increase the production of sweet potato starch-based bioplastics with 9 wt% bentonite clay performed on an integrated tool sonicator- stirred tank using a casting films method. In order to achieve an effective production process, a combination of sonicator-stirred tank with a paddle type impeller was used.

From the preliminary study on the scale up of production is gained bioplastics as many as 21 films per batch production with the heating and stirring process operating conditions at 85°C for 70 minutes.

Characterization results of tensile strength and elongation of bioplastic compared to the laboratory scale, respectively 41.65 kgf/cm² and 40.22 kgf/cm²; 26.42% and 5.17%, while the value of the water vapour transmission rate, 3.95 g/m²/hr and 7.85 g/m²/hr. Interaction between matrix - filler and amylose content of starch is a factor that's affects the mechanical and physical properties of bioplastic. This was confirmed through the analysis of SEM, FT-IR, XRD, and UV-vis. Based on the characterization, scale up of bioplastic production can performed using integrated tool sonicator-stirred tank.