Modifikasi Crosslinked Selulosa/PVA yang diperkuat dengan ZnO sebagai Bioplastik antimikroba dan antioksidan = Modified Crosslinked Cellulose/PVA and reinforced with ZnO as bioplastic antimicrobial and antioxidan

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Abstrak

Peningkatan penggunaan plastik konvensional nondegradabel menyebabkan permasalahan lingkungan dan kesehatan. Pengembangan plastik degradable atau bioplastik menjadi salah satu alternatif penyelesaian masalah tersebut. Selulosa merupakan salah satu bahan bioplastik yang dapat digunakan sebagai pengganti plastik konvensional nondegradable. Namun, penggunaan selulosa sebagai bioplastik memerlukan peningkatan sifat mekaniknya. Pada penelitian ini, memodifikasi film selulosa dengan PVA melalui metode blending yang ditambahkan glutaraldehid sebagai crosslinker dan filler ZnO sebagai penguat untuk meningkatkan sifat mekanik bioplastik. Optimasi sintesis selulosa/PVA dilakukan dengan variasi konsentrasi glutaraldehid sebesar 0%, 30%, 46% dan 56 % (b/b) serta ZnO sebesar 0%, 0,5%, 0,9% dan 1,3% (b/b). Film bioplastik juga ditambahkan minyak kayu manis sebagai antimikroba dan antioksidan. Hasil sintesis bioplastik dikarakterisasi dengan SEM, XRD, FTIR dan TGA serta dianalisa sifat mekanik, ketebalan, swelling, kelarutan, biodegrababilitas, aktivitas anti mikroba dan antioksidan. Berdasarkan data penelitian, diperoleh modifikasi film selulosa/PVA-crosslinked glutaraldehid dan penambahan filler ZnO dapat meningkatkan sifat fisik dan mekanik film bioplastik , dengan konsentrasi optimum variasi glutaraldehid pada 56% dan ZnO pada 1,3% dengan nilai tensile strength masing-masing sebesar 9,75 MPa dan 9,37 MPa. Adanya penambahan minyak kayu manis juga meningkatkan mutu bioplastik sehingga dihasilkan bioplastik yang bersifat antioksidan dan antimikroba.

.....The increasing use of non-degradable conventional plastics have caused environmental and health problems. The development of degradable plastics or bioplastics is an alternative solution to this problem. Cellulose is one of bio-based plastic material, commonly known as bioplastic that can be used as a substite for conventional non-degradable plastics. However, the use of cellulose as a bioplastic requires improvement in its mechanical properties. In this study, cellulose/PVA was modified with glutaraldehyde as a crosslinker and reinforced by ZnO as a filler in order to improve bioplastic mechanical properties. Optimization of cellulose / PVA synthesis was carried out with variations in glutaraldehyde concentrations which were 0%, 30%, 46% and 56% (w / w) and ZnO of 0%, 0.5%, 0.9% and 1.3% (w / w). The bioplastic film was also added with cinnamon oil as an antimicrobial and antioxidant agent. The results of bioplastic film synthesis were evaluated for SEM, XRD, FTIR and TGA and were analyzed for their mechanical properties, thickness, swelling, solubility, biodegradability, anti-microbial and antioxidant activity. Based on the research data, Modified crosslinked Cellulose/PVA with glutaraldehyde and reinforced with ZnO improved the physical and mechanical properties of the bioplastic film, with the optimum concentration of variations of glutaraldehyde of 20% and ZnO aof 1.3%. The addition of cinnamon oil also increased bioplastic properties which had antioxidant and antimicrobial bioactivity.