

Studi Awal Pembuatan Hidrogel Interpenetrating Polymer Network Berbasis PNIPAM dan Glukomanan dari Umbi Porang = Initial Study of Interpenetrating Polymer Network Hydrogel Synthesis Based on PNIPAM and Glucomannan from Porang Tubers

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Abstrak

Material cerdas berbasis polimer telah banyak dikembangkan untuk menunjang kehidupan manusia, salah satunya adalah hidrogel responsif temperatur yang mampu merespons stimulus berupa temperatur. Hidrogel berbasis poli(N-isopropilakrilamida) (PNIPAM) merupakan hidrogel responsif temperatur yang banyak diteliti untuk diaplikasikan pada bidang biomedis. Sementara itu, di Indonesia, terdapat umbi porang yang memiliki kandungan glukomanan yang tinggi. Glukomanan mampu mengalami gelasi sehingga potensial untuk digabungkan dengan hidrogel berbasis PNIPAM. Pada penelitian ini, disintesis hidrogel interpenetrating polymer networks (IPN) berbasis PNIPAM dan glukomanan yang berasal dari umbi porang (PGM) yang disebut sebagai hidrogel IPN-PNIPAM/PGM dengan memvariasikan rasio massa tepung glukomanan porang terhadap monomer NIPAM. Hidrogel disintesis melalui metode sequential IPN dan polimerisasi radikal bebas. Hasil karakterisasi FTIR menunjukkan bahwa hidrogel IPN-PNIPAM/PGM berhasil disintesis dengan adanya gugus hidroksil dan amida yang berasal dari PGM dan PNIPAM. Untuk menguji responsivitas hidrogel terhadap temperatur dan pH, dilakukan pengujian swelling ratio pada berbagai temperatur dan pH. Seiring peningkatan rasio massa glukomanan, kemampuan swelling hidrogel IPN-PNIPAM/PGM meningkat tetapi responsivitasnya terhadap temperatur menurun dan responsivitasnya terhadap pH tidak terpengaruh.

.....Polymer-based smart materials have been widely developed to support human life. One of them is thermoresponsive hydrogel which can respond to temperature stimuli. Poly(N-isopropylacrylamide) (PNIPAM)-based hydrogels are thermoresponsive hydrogels that are widely studied for biomedical applications. Meanwhile, in Indonesia, there are porang tubers that have high glucomannan content. Glucomannan itself can undergo gelation, which makes it potential to be combined with PNIPAM-based hydrogels. In this research, interpenetrating polymer networks (IPN) hydrogels based on PNIPAM and glucomannan from porang tubers (PGM), called IPN-PNIPAM/PGM hydrogels, were synthesized by varying the mass ratio of porang glucomannan to NIPAM monomers. The methods used were sequential IPN and free radical polymerization. The results of FTIR characterization showed that IPN-PNIPAM/PGM hydrogels were successfully synthesized with the presence of hydroxyl and amide groups originating from PGM and PNIPAM. Furthermore, the responsiveness of the hydrogels to temperature and pH was assessed by investigating the swelling ratio at various temperatures and pH. As the mass ratio of glucomannan increased, the swelling ability of the IPN-PNIPAM/PGM hydrogel increased but its responsiveness to temperature decreased. Noteworthy, its responsiveness to pH was not affected.