

**Enhanced activity and stability of immobilized cellulase by cross linking with amine and glutaraldehyde on non-porous nanoparticles**

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The immobilization of cellulase onto non-porous nano silica beads with amine functional group on the surface via enzyme coating by glutaraldehyde (GA) in the presence of poly (ethylenimine) was investigated. The relative activity of immobilized cellulase prepared by enzyme coating with 0.5% of ethylenimine oligomer mixture and GA was around 2.7 times higher than that of immobilized enzyme prepared by covalently attachment. The reuse of immobilized cellulase prepared by enzyme coating showed higher remaining activity than that prepared by covalent attachment after 5 reused times which is 85% and 78%, respectively. On the other hand, enzyme coating remains 89% its activity after 20 days under storage condition while covalent attachment enzyme and free enzyme remain 63% and 13% of their initial activities, respectively.