Jirapat Boonmee 2009: Study of Conformation and Drug Release Mechanism of Doxorubicin Conjugated Glycol Chitosan Nanoaggregates by Molecular Modeling. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Thongchai Srinophakun, Ph.D. 83 pages.

This research studied the geometry parameters of a drug delivery system which consisted of anti-cancer drug, doxorubicin, conjugated with glycol chitosan polymer via *cis*-aconityl linkage. Molecular energy of this drug carrier showed that the *cis*-aconityl linkage can improve the molecular structure in order to control burst drug release under blood pressure. Doxorubicin release mechanism from the linkage was also studied. The *cis*-aconityl had pH-sensitive behavior. The activated energies of doxorubicin release mechanism in acid determined by B3LYP/6-31G//PM3 method were 122.41, 119.27, 160.18 and 222.22 kcal/mole and by B3LYP/6-31G//HF/6-31G method were 54.23, 109.28, 219.98 and 980.49 kcal/mole with mono-, di-, tri-, and quanta-ethylene glycol, respectively. The activated energies of this mechanism in normal condition by B3LYP/6-31G//PM3 method were 379.06, 342.03 and 433.17 kcal/mole and by B3LYP/6-31G//HF/6-31G method were 387.94, 325.67 and 444.78 kcal/mole with mono-, di- and tri(ethylene glycol), respectively. Interpreting from these energies, the doxorubicin can be released in acid solution, but not in normal solution because of too high activated energy. The length of ethylene glycol chains in glycol chitosan polymer has an effect on drug carrier conformation and drug release. As the length of ethylene glycol increases, the structure of the carrier is more stable and reduces the released mechanism of doxorubicin. Glycol chitosan polymer can also be degraded in acid solution.

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