



Novel Processes for the Synthesis of Polyisoprene and Polyisoprene-Polyisobutylene Block and Graft Copolymers based on Natural Rubber Biosynthesis



The Puskas group CHE #0616834 GOALI
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The main objective of this project is to design a Natural Living Polymerization (NLP) system that may lead to synthetic “Natural Rubber” (NR or *cis*-1,4-polyisoprene *c*PIP). In order to investigate our hypothesis that NR biosynthesis is consistent with the mechanism of living/controlled polymerizations, we propose two simultaneous projects. In Project I, we will study modified *in vitro* biosynthesis processes utilizing synthetic polyisobutylene-based macroinitiator. Combination of fully-synthetic living carbocationic polymerization, yielding the precursor of the macroinitiator, with NR biosynthesis, will produce a fundamentally novel block copolymer: polyisobutylene-*b*-*cis*-1,4-polyisoprene (PIB-*b*-NR). Project II is to demonstrate a conceptually new synthetic living (i.e., chain transferless, terminationless ionization-condensation-elimination) polymerization (NLP), similar to NR biosynthesis, to produce polyisoprene.



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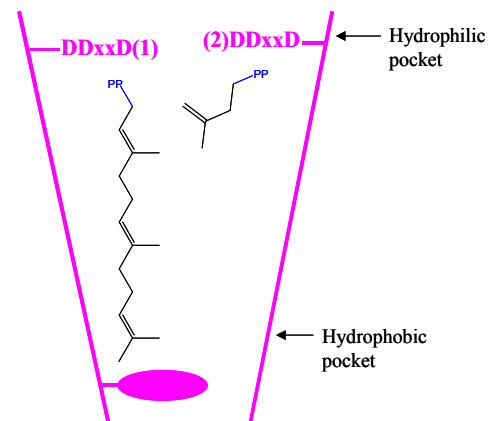
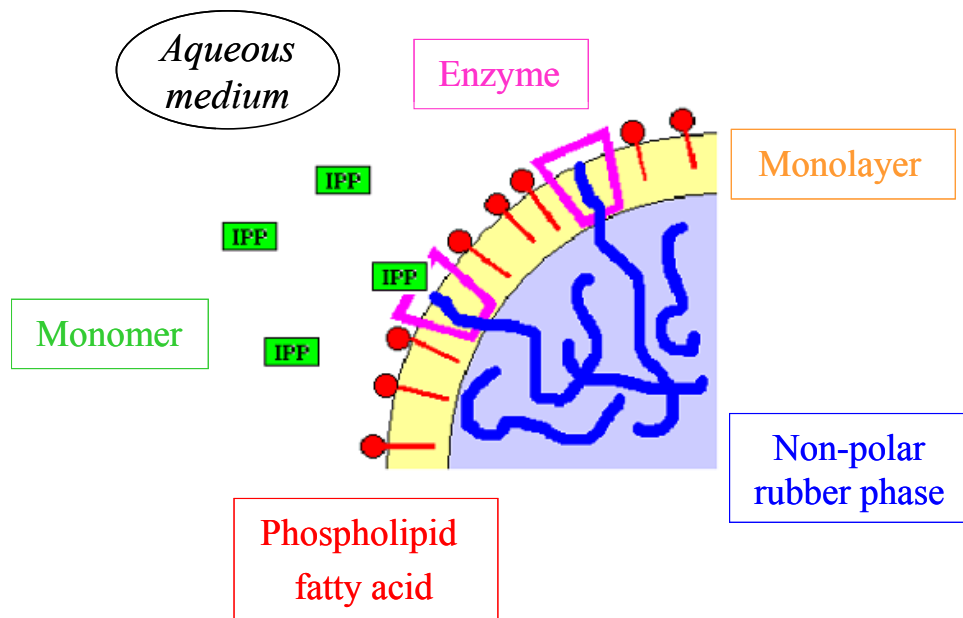
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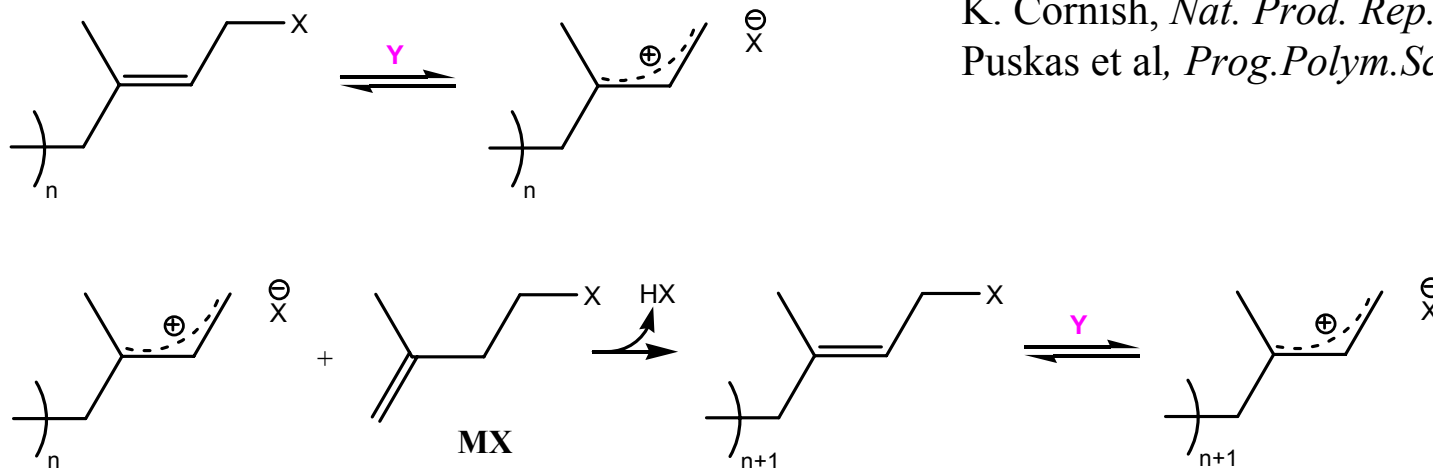
Natural Living Polymerization NLP



Prenyl transferase (cis or trans)

Cofactors: Mg^{2+} , Mn^{2+}

Propagation



K. Cornish, *Nat. Prod. Rep.* **2001**, *18*, 182

Puskas et al, *Prog. Polym. Sci.* **2006**, *31*, 533