The objective of the project is to synthesize \[\text{ethene-}\eta^5\text{-}[1-(8\text{-quinolyl})-2,3,4,5\text{-tetramethylcyclopentadiene}]-\text{cobalt(I)}\text{BAr}_r\], a catalyst for \(\alpha\)-olefin dimerization. The synthesis involved 5 steps. The starting materials used are 2-bromoaniline, glycerol, concentrated sulfuric acid and iodine. The target analyst should be able to dimerize linear \(\alpha\)-olefins, a terminal alkene attached to a saturated and unbranched hydrocarbon chain, which is used as precursors in the manufacture of surfactants, synthetic oils, and co-monomers in a variety of plastic compounds.

During the synthesis, air-sensitive techniques were applied for most the steps. Reactions were carried out under nitrogen gas or in the dry-box, if necessary. After each step in the synthesis plan, the identity and purity of the compound were confirmed by nuclear magnetic resonance (NMR) and/or gas chromatography-mass spectrum (GC-MS). In step 1, 2-bromoaniline and iodine crystals reacted with glycerol under \(N_2\) to produce a brown oil (crude 8-bromoquinoline). After purification, I was able to obtain 8-bromoquinoline at >95% purity and 23% yield. In step 2, 8-bromoquinoline obtained from the first step was reacted with n-butyl lithium followed by 2,3,4,5-tetramethyl-2-cyclopentenone. After separation by wet column chromatography \(\text{cp}^*\text{-quinoline was obtained at >95% purity and 21% yield. In step 3, cp}^*\text{-quinoline was added to the dicobalt octacarbonyl complex in the presence of 1,3-cyclohexadiene, a reducing agent. The crude was directly reacted with iodine crystals, after which a crude of <50% purity was obtained. NMR confirmed that the crude contains the target product diiodo-\eta^5\text{-}[1-(8\text{-quinolyl})-2,3,4,5\text{-tetramethylcyclopentadiene}]-\text{cobalt(III).}

After six weeks of research, 4 out of 5 steps were successfully completed, yielding diiodo-\eta^5\text{-}[1-(8\text{-quinolyl})-2,3,4,5\text{-tetramethylcyclopentadiene}]-\text{cobalt(III)}, which is saved for further research. The techniques of the first two steps were generally mastered. After 3-5 trials, satisfactory yield and purity were obtained. However, due to time constraint, only 2 trials were conducted for the synthesis of this compound, of which only one was successful. It is necessary to repeat the synthesis in order to produce better yields and purity. Another target is to increase the scale of the first two steps of the synthesis plan in order to produce enough starting material for the consequent steps.

Graphs/images/figures (if applicable)

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References (if applicable)