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# NANOPARTICLE CATALYSTS FOR SUZUKI CROSS-COUPLING

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Catalysis is used for accelerating chemical reactions, which can significantly reduce the reaction cost. The use of catalysts is abundant in pharmaceuticals, petroleum, and synthetic fuel industries. Although transition metal-based catalysts are the most abundant, they have specific limitations such as the high cost of metals and the difficulty involved in separating reaction from product. Catalytic membrane reactors (CMR) are one popular type of catalytic reactor and are unique in that they combine the "reaction" and "separation" step. The separation occurs between unwanted byproducts or within the catalyst itself. I have synthesized Au and Pd silica supported nanoparticles in order to catalyze a Suzuki cross-coupling reaction. Before designing and characterizing a CMR made of Au or Pd coated silica nanoparticles I demonstrated that the Suzuki cross-coupling reaction will take place in bulk conditions with the metallic catalysts I have prepared. Each trial was given 24 hours to complete at room temperature or 60 C in the presence of nitrogen gas; they were then characterized by analyzing progress and formation of the product by thin-layer chromatography (TLC). I found that both Au and Pd catalysts are active in the selected conditions and, interestingly, produced the best yield at room temperature. We will continue testing various reaction conditions in order to accurately characterize the limitations of the catalytic material I have synthesized. We hypothesize that by using a catalytic membrane reactor we will be able to tune the microenvironment using polymer brushes to improve the yield and to make the reaction favorable under milder conditions than in bulk. We found that either gold or palladium nanoparticles would be adequate catalysts to make a catalytic membrane; however, considering that palladium gives a better percent yield at room temperature, this will be the material that we will continue to work with to make and optimize a catalytic membrane.