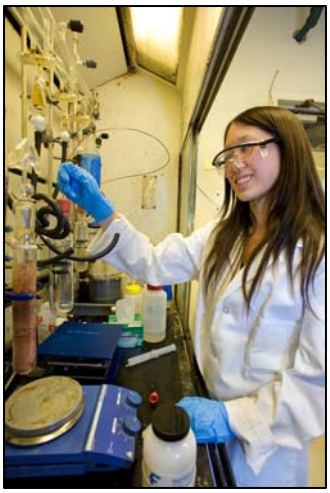

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Hi! I'm Alice. I graduated from El Cerrito High School and am planning to attend Stanford University this fall. I have always loved science and math, but I really fell in love with chemistry when I took Advanced Placement (AP) Chemistry. I can't really explain what it was about it, but I just understood it and liked it. As much as I enjoyed AP Chemistry, it didn't teach me all that I wanted to know. That is a big reason why I applied to this program: I wanted to learn more. It's hard to know exactly what I want to do in the future, but I know that I want to major in Chemistry. Other than science and math I love art—music included—of all kinds, from drawing to scrapbooking to singing.

The Effects of Ligand Design on Catalysts

Catalysis is an extremely important process used to lower the energy needed to run reactions to produce various chemical compounds. Catalysts can be made by adding ligands—structures that control the coordination geometry around metals—to various metals. Group 4 metal compounds containing an imido functionality—metal nitrogen double bond—have been proven to be highly reactive. Consequently, research is being conducted to see whether Group 5 imido compounds can produce the same reactivity. Group 5 imido compounds have an additional valency, which is the number of covalent bonds a molecule can form, allowing for more options when designing a ligand structure. The more options there are, the more possibilities there are to form different compounds, each with varying characteristics. For example, $[Cp^*Ru(Ph_2PO)_3]^{2-}$ is a ligand that should be able to bind with Tantalum—a Group 5 metal—to form pre-catalysts. $[Cp^*Ru(Ph_2PO)_3]^{2-}$ is air sensitive, requiring much of the reaction to be done in an inert atmosphere, in this case, nitrogen. This research is especially important because of the rising need to conserve energy. Catalysts are an effective way to lower the amount of energy used to run reactions on a large scale. If there is more time we will be looking at hydroamination reactions, the addition of an imine to an alkene, in which all the reactants turn into product, leaving no waste behind.