



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

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Project Title An Alternative Source of Energy: Can Sawdust Be Catalyzed into Fuel?	
Abstract Objectives/Goals The objective of this project is to create an environmentally friendly source of renewable energy. The goal is to turn discarded sawdust, which is 42% cellulose by mass, into a bio-fuel with structures and properties similar to gasoline. Methods/Materials The experiment was divided into two parts: A and B. First, through acid hydrolysis [using different acids: HCl, HBr and H(2)SO(4)], the cellulose was hydrolyzed and transformed into glucose. Experiments were neutralized with NaOH. The remaining sawdust was separated from the glucose solution using a vacuum and funnel filter. In part B, the glucose solution was treated with ZSM-5 catalyst [Mn3024]. With catalytic activity and high temperatures of 350C, the reaction between the glucose and the ZSM-5 catalyst was carried out in a parr bomb. The products were then analyzed by Gas Chromatography/Mass Spectrography. Results Products contained carbon chains in the range of 1-5, and all contained oxygen contaminants. Even though gasoline-like fuel was not produced, other valuable products such as Butyrolactone and Methoxytetrahydrofuran were found. Conclusions/Discussion The oxygen atoms are all parts of hydroxyl groups and were not removed to become H(2)O due to the lack of proton donation. In future experiments, experiments will be carried out in a similar fashion except with a source of proton donation to hydrolyze the hydroxyl groups. Butyrolactone have a wide variety of uses including roles in plant growth regulators and pharmaceuticals. The Methoxytetrahydrofuran class of products is currently being researched to replace MTBE, which is a fuel additive. MTBE is a possible carcinogen and pollutes our underground drinking water.	
Summary Statement To find an alternative source of energy via turning discarded sawdust into a gasoline like fuel through acid hydrolysis, catalytic activity, and high temperatures.	
Help Received Dr. Eric McFarland, professor of Chemical Engineering at UCSB, provided me with a lab and equipment. Dr. Shouli Sun and Dr. Mike Wrysta, senior scientists of GRT Inc. supervised my experiments.	