



**CALIFORNIA STATE SCIENCE FAIR  
2009 PROJECT SUMMARY**

<b>Name(s)</b> <b>Leonard I. Tampkins, IV</b>	<b>Project Number</b> <b>S0832</b>
<b>Project Title</b> <b>Analysis of Magnesium Oxide Aerogel Air Filtration and Various Ways to Increase Its Efficiency</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Aerogel is simply a low density porous solid formed when the liquid in a gel is replaced with a gas; this is done by a process of supercritical drying. Aerogels can be used as a contaminant filter in fluids. Improving on such discoveries is important due to the increasing global emphasis on clean air and water. This experiment will measure the growth of airborne bacteria and is designed to discover how one might increase the efficiency of anti-bacteria air filters through the use of Magnesium Oxide Aerogels.</p> <p><b>Methods/Materials</b> I used a sterilized box divided into two specific chambers, one of which is airtight. A single clean agar plate is placed into the airtight chambers. The divider in between the two chambers has a hole in it; this allows me to place a variety of filter media in-between the two chambers. I then analyze the efficiency of airborne contaminant filtration by Aerogels, as well as comparing it to the filtration efficiency of commercial filters.</p> <p><b>Results</b> The data suggests that the application of Magnesium Oxide Sol-gels on a certain filter media reduces the amount of microbes that passes through that filter.</p> <p><b>Conclusions/Discussion</b> A Magnesium Oxide Aerogel filtration system would be a more efficient filter, and better than regular commercial filters because: Magnesium oxide Sol-gels kill bacteria on contact, the pores in the sol-gel substructure are not more than 100 nanometers in diameter, too small for bacteria or fungal spores to pass through; Aerogels have a greater surface area than cloth filters; and sol-gel filters generally have a higher flow rate than cloth filters, meaning that more air can pass through a sol-gel filter in any given time when compared to a cloth filter.</p>	
<b>Summary Statement</b> This experiment was designed to discover if a magnesium Oxide Aerogel filtration system is more efficient than commercial cloth air filters (in terms of filtration of bacteria/ microbes).	
<b>Help Received</b> I used lab equipment to synthesize the Magnesium Oxide Aerogels at California Polytechnic University in Pomona under the supervision of Professors Alex, Dong, Paige, and the undergraduate students Noam, Jessica, and Stella.	