



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> <b>Jessica H. Hui</b>	<b>Project Number</b> <b>J1011</b>
<b>Project Title</b> <b>Bringing Ozone Back into Style</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Water treatment is important for developing countries where clean water is of shortage. In this experiment, my goal is to develop a new wheel-based dissolved ozone-making method for water treatment. I hypothesize that this new method will be safer and more cost-effective than the traditional bubbling method that leaks ozone into the environment.</p> <p><b>Methods/Materials</b> A homemade rotating wheel (covered by 4 layers of plastic nets) is built to drag air into water, forming dissolved oxygen (Figure 1). Then, the dissolved oxygen becomes dissolved ozone in the presence of an underwater UV light (Figure 2). The dissolved ozone may be further irradiated by the UV light and is partially turned into hydroxyl radicals. I used ink color removal, potassium iodide oxidation and bacterial killing as markers to demonstrate the power of this new method for water treatment while using a traditional bubbling method as a reference.</p> <p><b>Results</b> Results in Figure 3, 4 indicated that the dissolved ozone-making apparatus effectively removes the ink color from the water sample without any detectable ozone leakage. A time course of the dissolved ozone for the removal of the ink color was successfully demonstrated in Figure 5. Results in Figure 6 successfully showed a time course of the dissolved ozone treatment for the generation of free iodine from potassium iodide. The results indicated an increasing effectiveness of the treatment over time. Surprisingly, I have found that the dissolved ozone-making apparatus effectively removed chlorine from tap water (Figure 7). Finally, I have used the dissolved ozone-making apparatus for bacterial killing in water. The results in Table 1 indicated that the <math>137 \pm 46</math> bacterial colonies/0.1ml is completely reduced to zero in 9 minute of the treatment in all three experimental groups.</p> <p><b>Conclusions/Discussion</b> This homemade rotating wheel-based apparatus is easily built at a low cost and safe to use without leaking ozone. I have demonstrated that this wheel-based apparatus removes ink color, oxidizes potassium iodide and kills bacteria more effectively than that of the traditional bubbling method. It has the potential to be a safer and more cost-effective technology for water treatment in developing countries.</p>	
<b>Summary Statement</b> In this project, I constructed and evaluated a rotating wheel-based dissolved ozone making apparatus for safe and cost-effective treatment of water.	
<b>Help Received</b> Professor Matthew Hui (former Amgen scientist) from Chinese Academy of Science helped me build the homemade wheel-based machine for dissolved ozone making at my house. My mother and stepfather for support.	