



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Mikael H. Matossian	Project Number J1025
Project Title The Effects of Atmospheric Pollution on the Performance of Solar Cells	
Abstract Objectives/Goals The objective of my project is to measure the effects of atmospheric pollution on the electrical current produced by two types of solar cells that were exposed to constant simulated sunlight; low-efficiency, single-junction silicon (Si) and high-efficiency, triple-junction gallium arsenide (GaAs). Methods/Materials Si and GaAs solar cells were placed in a large plastic container and were illuminated with a lamp that simulated sunlight. For constant lamp illumination, changes in the electrical current produced by each solar cell were measured for varying concentrations of five different types of air pollutants set up in the large plastic container; 1.) Aerosols (airborne dirt particles) 2.) Engine exhaust fumes 3.) Carbon dioxide (CO ₂) 4.) Ozone (O ₃) and 5.) Water vapor (H ₂ O). Each of the five pollutants had a different effect on reducing the amount of simulated sunlight reaching each cell, and resulted in different electrical currents being produced from each cell. Results 1. Exhaust fumes reduced the current of the Si cell by 10%, while GaAs was unaffected. 2. CO ₂ reduced the current of the Si cell by 2%, while GaAs was unaffected. 3. O ₃ reduced the current of the GaAs by 2-5%, while Si was unaffected. 4. Water vapor caused a gradual reduction in the current of the Si cell, while GaAs was almost unaffected. 5. Aerosols reduced the electrical current of both Si and GaAs by 7%. Conclusions/Discussion Solar cells are devices that convert sunlight into electricity. Atmospheric pollution can reduce the amount of sunlight reaching a solar cell, and thereby cause a reduction in the electrical current produced by the solar cell. My results indicate that five common atmospheric pollutants cause different effects on the electrical current produced by low-efficiency Si and high-efficiency GaAs solar cells. In addition, high-efficiency GaAs solar cells appear to be generally more resistant to three out of the five common atmospheric pollutants than Si solar cells. These findings should be applicable to solar cell engineers designing solar panels and power plants with these two types of solar cells.	
Summary Statement High-efficiency GaAs solar cells are more resistant to common atmospheric pollutants than low-efficiency Si solar cells.	
Help Received Professor Antonio Machado (California State University Northridge) advised test methodology; Dr. Christian Gueymard (Solar cell expert) critiqued pollutant test matrix; Boeing Satellite Development Center (El Segundo, CA) supplied solar cells; Father helped assemble test apparatus.	