CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Ryan J. Bunk

Project Number
S0694

Project Title
Nanoporous Niobium Oxide

Abstract

Objectives/Goals
This project was to determine if photoelectrochemical etching ("photoetching") would successfully increase surface area of thin films by increasing nanoporosity.

Methods/Materials
Samples of niobium metal foil thicknesses 0.5-1mm thickness were heated until the oxide layer was lustrous dark blue, indicating thin film formation. 5 Samples were set aside as control, 8 samples were put in experimental. Experimental samples were photoetched under 1 molar sulfuric acid, ultraviolet C light, and a 1.5V electrical potential for 45 minutes. Control samples were not processed further after heating. Samples were analyzed by immersing in a solution of aqueous 70% isopropanol and elemental iodine, and determining quantity of solution absorbed by redox titration. Surface buildup of iodine solution by wetting was removed by pressing against the side of the beaker prior to titration.

Results
The samples that had been photoetched, on average, increased in solution absorption 172%, indicating that the samples had experienced an increase in nanoporosity. The samples were not discolored by etching, indicating that increases in macroporosity or other large material removeal were negligible.

Conclusions/Discussion
The experimental, photoelectrochemically etched samples had successfully increased in nanoporosity, and by extension, increased in surface area.

Summary Statement
Increasing surface area of photocatalytic niobium V oxide thin films.

Help Received
Used lab equipment and materials at Adolfo Camarillo High School under the supervision of Mr. Tanner, Parents and Mr. Inouye reviewed and made suggestions on report, abstract, and poster