

Report Form for Modern Materials Lab

For your report, answer the following questions.

Station 1. When you tested the conductivity of your aluminum bar you should have observed that the portion of the bar that soaked up the dye did not show any conductivity, but that the undyed portion of the bar had a measurable conductivity. Explain why the two parts of the bar showed this difference in conductivity. As part of your answer, identify the chemical form of the aluminum present in each part of the bar.

Station 2. Use the following link to download the paper “Coloring Titanium and Related Metals by Electrochemical Oxidation” by Emily Gaul (<https://doi.org/10.1021/ed070p176>). Table 2 in the paper describes the color of the Nb_2O_5 films as a function of applied voltage. Although in most cases the voltages in this table do not match exactly the voltages you used, you can nevertheless compare your results to those reported here. In a brief paragraph, discuss the similarities between your results and those reported by Gaul.

Station 3. You examined the unit cell for the superconductor $\text{YBa}_2\text{Cu}_3\text{O}_7$. What did you conclude about (a) the type of hole that yttrium occupies, (b) the number of nearest neighbors for copper ions, and (c) the oxidation state for copper. For the last of these questions, be sure to explain how you arrived at your answer.

Station 4 and 5. Of the four compounds you explored here (MnO_2 , Mn_2O_3 , KMnO_4 , and Fe), three are expected to interact with an applied magnetic field and one is not. Which compound cannot interact with an applied magnetic field? Explain how you arrived at your choice.

Station 6. Nitinol is an alloy of nickel and titanium in which titanium adopts a simple cubic lattice with nickel occupying holes in the lattice structure. Draw a picture of the unit cell, being careful to label each atom. What type of hole is occupied by nickel?