Team name: _____ Date: _____ Class: _____

Lab Activity Handout Answers

Problem: Which nanoparticle will bleach (or "photo-sanitize") water the fastest after UV light exposure: titanium dioxide, zinc oxide, or magnesium oxide?

Hypothesis: I predict that the titanium dioxide nanoparticle will bleach the fastest

because the chemical properties of titanium dioxide make it the most effective.

Materials:

graduated cylinder

methyl orange

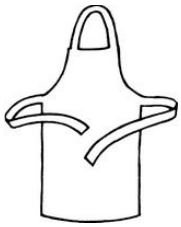
methylene blue

micro pipette

marker

SAFETY Equipment

goggles



lab coat/apron

stopwatch

plastic cups (2-oz)

distilled water

ZnO zinc oxide

MgO magnesium oxide

TiO_2 titanium dioxide

Procedure:

1. Collect all _materials_; designate responsibilities to each lab group member, if needed.
2. Obtain _8__ plastic cups with lids and pour _20__ ml of distilled water into each cup.
3. Pour ___3__ml of methyl __orange___ into the 4 cups with water.
4. Pour ___3__ml of methylene ___blue_____ into the other 4 cups with water.
5. Label the four methyl orange cups as ___ZnO_____, _____MgO__, _____TiO_2_____, & "CONTROL."
6. Label the four methylene blue cups as _____ZnO_____, __MgO_____, __TiO_2_____, & "CONTROL."
7. Use a ___pipette_____ to place ___3____ drops of each sample oxide as labeled on your cups & be sure to _____stir/mix_____ your solutions well.
8. Take a ___picture___ of your methyl orange and methylene blue labeled cups with your phone (before light exposure) and be ready to take your cups outside for UV light exposure.
9. Using a stopwatch, record the time in ___seconds_ it takes for each sample to bleach (do not run longer than 10 min). Take another picture of the cups (after light exposure).

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Data Table:

COMPLETE BLEACHING AFTER UV EXPOSURE in seconds				
Sample solutions	CONTROL	Titanium Dioxide	Magnesium Oxide	Zinc Oxide
Methylene blue	No bleaching			
Methyl orange	No bleaching			

Illustration: (students color in their results using their picture before & after light exposure.)

Samples before UV light exposure

Methylene Blue Samples

ZnO MgO TiO_2

Methyl Orange Samples

ZnO MgO TiO_2

Samples after UV light exposure

Methylene Blue Samples

ZnO MgO TiO_2

Methyl Orange Samples

ZnO MgO TiO_2

Conclusion: I accept my hypothesis because titanium dioxide was the nanoparticle that bleached the dye the fastest. This is due to its photocatalytic properties that we discussed in class.