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Sample Lab Report -

The Oxygen Content of Air

Introduction

In this experiment we measured the percent composition of oxygen in air. The measurements were made by inverting a graduated cylinder containing air and acid soaked steel wool into a beaker containing water. The iron of the steel wool reacted with the oxygen to generate rust (iron oxide). The acid served to speed up the reaction between the iron and oxygen. As the steel wool reacted with the oxygen trapped in the graduated cylinder the volume of gas in the cylinder decreased causing the water level in the inverted cylinder to rise. The decrease in the volume of gas in the cylinder is corresponds to volume of oxygen present in the cylinder initially. From the change in the water levels and the initial volume of air trapped in the cylinder, the percentage of oxygen in air was calculated.

Procedure

The procedure was the same as that given in the lab manual, except three trials were performed rather than two.

Data Analysis

Data:

height of cylinder = 125.5 mm
radius of cylinder = 10 mm

	Trial #1	Trial #2	Trial #3
Initial height of water	8 mm	8 mm	9 mm
Final height of water	14 mm	25 mm	29 mm
mass of steel wool	0.75 g	0.71 g	0.73 g
volume of steel wool	95.4 mm^3	90.3 mm^3	92.8 mm^3
volume of air	3.69×10^4 mm^3	3.69×10^4 mm^3	3.69×10^4 mm^3
volume of oxygen	1.88×10^3 mm^3	5.34×10^3 mm^3	6.28×10^3 mm^3
oxygen percentage of air	5.1 %	14.4%	17.0%

The average percentage of oxygen in air was determined to be **16%**.
Note: data from trial #1 was not used for this calculation. See discussion section of report.

Sample calculations:

Here you should show calculations for one trial. Include formulas. For instance:
Using data from Trial #2--

Volume of air = $\pi r^2 h$,
where r is the radius of the cylinder and h is the height of the air column (height of the cylinder - initial height of water)

Volume of air $= \pi\ (10\ mm)^2 (125.5\ mm - 8\ mm)$
$= 3.69 \times 10^4\ mm^3$
(and so on for each calculation)

Discussion

We determined the oxygen composition of air to be 16% by volume. This value is much lower than the accepted value of 20.6% at sea level. This is an error of 22% from the accepted value. We found the first trial did not work properly and so we did not include the data from the first trial. (The value of 4.8% O_2 from trial #1 was outside the standard deviation of the average of the three results, which indicated that it was probably not a valid data point.) In the first trial, our steel wool was tightly packed in the bottom of the graduated cylinder, and our TA indicated that this might cause a problem. Because the oxygen must react with the steel wool to be "detected", the more tightly the wool is packed the less chance the oxygen has to diffuse to the surface of the steel wool and react.

Our results indicate that the procedure is not a very accurate predictor of oxygen content. Empirical evidence suggests that the oxygen content in the room was normal (everyone was breathing normally), but yet we determined the percentage of oxygen to be 22% below what it should be. Probably we would have gotten better results if we allowed the reactions to go for longer than 30 minutes each. We saw that the second two trials produced much more rust on the steel wool than the first trial that had the densely packed steel wool. Low values of oxygen in the air are consistent with incomplete reaction between the oxygen and the steel wool. The amount to which the steel wool is packed seems to have a great impact on the final result, so that a precise value of the oxygen content of air would be difficult to determine using this experimental procedure.

[Answers to questions would go here.]