

Project Report

Investigating the Properties of Plasma, the Fourth State of Matter

Tony Romanello Murray High School

Classroom Portion

Completed Work:

Equipment provided by this grant was used three times in the classroom. When covering properties of matter, plasma was discussed and the properties of the fluorescent tube and the plasma ball were demonstrated. During this usage, emphasis was placed on the collective nature of the plasma. This was accomplished by demonstrating how the plasma stream in the ball was concentrated at the point where the ball was touched and how the plasma in the fluorescent tube was affected by the application of a magnet. We then discussed how little information about plasma was available in the textbook and students were assigned to research the industrial uses of plasma and to write a 1 - 2 page paper on this topic.

The second use of the equipment was during the study of electric fields and magnetism. During this unit, the presence of an electric field was demonstrated using a small fluorescent tube and a plasma ball. Students were able to recognize that the electric field of the ball was able to light the tube at a distance. This field effect, i.e. a force acting at a distance, was well received by the students and made the discussion of fields much easier. Also, the ball was useful in the discussion of grounding. (Thus explaining why the plasma was concentrated on the spot where the ball was touched.) When discussing magnetism, again the demonstration of applying a magnet to the fluorescent tube was used. Emphasis was placed on the domain theory of magnetism, and how the electrons in the magnetic poles were repulsive to the plasma.

Finally, when discussing atomic structure and nuclear energy, the plasma ball again brought into play. After discussing the relationship between quantum theory and the emission of light, i.e. " $E = hf$ ", I brought out the plasma ball and asked the students to observe it. Then they were asked to explain, in paragraph form, how quantum theory explained the differing colors of light in the ball.

Future Investigation:

The one goal I failed to reach in the classroom was that of "student centered" investigation. I have been unable to develop a lab or activity where groups of students investigate the properties of the plasma ball or fluorescent tube on their own. This is a goal I intend to work toward during the next school year.

Dissemination:

Completed work: