

SMART/STUPID BALLS

(Also known as Happy/Sad balls)

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A Smart Ball, sometimes called a Super Ball® is a highly resilient ball which was originally manufactured by the Wham-O Mfg. Co. Similar products are marketed under names such as High-Bounce Ball or similar names by other manufacturers.

The Smart Ball is a ball or sphere having extremely high resilience factor in excess of 90% and a high coefficient of friction. These two qualities cause the ball to react in an extraordinary and unpredictable manner when bounced or struck. Thus, any spin or “English” applied to the ball will be accentuated when it rebounds from a hard surface.

The Smart Ball has a specific gravity of 1-1.3 (The specific gravity of water is 1.0). It is composed of about 100 parts polybutadiene, 0.5 to 15 parts sulfur vulcanizing agent, and 5 to 15 parts of filler such as hydrated silica, carbon black or lithium oxide. The sulfur vulcanizing agent is added in excess of that in products such as automobile tires (which contain about 3 parts sulfur) to produce cross-linking between polybutadiene chains resulting in the high resiliency. The ball is molded at a pressure of between 500 and 3,000 p.s.i. for 10 to 30 minutes at a temperature of 285-340°F (140-171°C). This produces the Smart Ball, with the properties described above, which is usually dark in color due to the fillers. To produce translucent or colored smart balls, the fillers have been modified and brightly colored pigments are added. These changes do result in a reduced resiliency by a few percent. Another characteristic of these balls is an ability to conserve energy, that is, when bounced, the ball will dissipate very little of the energy imparted to it in the form of heat.

The Stupid Ball may be composed of several different materials. Common materials used are a block co-polymer of poly(styrene-butadiene) or a block co-polymer of poly(vinyl-butadiene). This material has a specific gravity that is higher than that of a smart ball (one sample had a specific gravity of 1.17 compared to a Smart Ball at 1.03) and a structure that has a low resiliency and absorbs energy. Thus, when the ball is dropped, it does not bounce.

These properties make the Stupid Ball material useful for a number of applications. The poly(styrene-butadiene) co-polymer is used in automobile tires where it helps to absorb some of the bumps encountered on the highway. This type of material has also found use in lining the ballistic containers used by bomb squads (these look like big trash cans). Should a bomb explode, this material will absorb a significant amount of energy.

PROCEDURE

1. MATERIALS NEEDED:

Smart/Stupid Ball set. (Available from Flinn Scientific)

2. SAFETY PRECAUTIONS:

Wear safety goggles or glasses

A Smart Ball can rebound in unexpected directions. Take care in bouncing the ball so that it does not hit anyone or anything with sufficient force to cause injury or damage.

When dropping a Stupid Ball from a high location, take care that it does not hit anything that can be damaged.

3. DISPOSAL:

There are no disposal problems with materials in this investigation.

4. EXPERIMENTAL PROCEDURE:

Bouncing ball activities

Drop a Smart Ball onto a hard surface (tile or cement floor preferred). Describe its behavior.

Repeat this procedure with a Stupid Ball. Describe its behavior.

Repeat this procedure with both balls, dropping them from a measured height. Measure how high they bounce.

Find a volunteer. Ask the subject if he/she can drop a ball and spin around and catch it before it bounces a second time. Demonstrate this using the Smart Ball. Switch the balls and hand the subject the Stupid Ball.

As previously mentioned, different formulations of Super Balls producing bright colors or translucent balls have different resiliencies. Obtain a number of different colored Super Balls and have a ball bouncing contest. Line up students and have them drop the balls at the same time, from the same height, to see which bounces higher. Give the Stupid Ball to a student who is most likely to “break a ball” or “get an assignment messed up”.

The effect of temperature on the Smart/Stupid Ball

Some formulations may be affected by temperature.

Put both balls in a freezer. Drop both balls. Does their behavior change when they are cold?