



MAGIC SAND™/MYSTIC SAND

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Magic Sand™, also called Super Sand, Mystic Sand, Qsand and Zsand is sand (silicon dioxide) that has been treated with a colored dye and coated with a finely divided hydrophobic silicon coating. Due to its hydrophobic coating, Magic Sand can be placed in water to form underwater towers or columns and designs, and then be removed and found to be completely dry. Because of its water repellency, the particles of Magic Sand will stay together as a separate phase in the water similar to the phase separation of a polar and a non-polar liquid such as vinegar and oil

The Magic Sand is an application of an invention from Cabot Corporation, Boston, Mass, originally used for the removal of oily contaminants from water systems. A similar material is a fumed silicon dioxide, called Cab-O-Sil, marketed by Cabot Corp. which is used for many applications such as thickening, thixotropy, suspension of solids, and optical clarity in products such as coatings, adhesives, cosmetics, inks, plastics, and rubbers. It is also used as an anti-caking agent to promote the free flow of dry powders.



Magic Sand is prepared by treating an inland sand (which has grains with rounded edges for better flow characteristics) with an organohalosilane such as dimethyldichlorosilane, $(\text{CH}_3)_2\text{SiCl}_2$. In the reaction, the surface of the sand becomes coated with a thin monolayer silicone film, $(\text{CH}_3)_2(\text{OH})\text{Si-O-}$ which repels water because it is similar to a hydrocarbon film. Materials such as paper, wood, glass, silk, and porcelain can also be coated with a water-repellent film by simply exposing them to the vapor of organohalosilanes.

A Magic Sand type of material can be made by spraying oven dried sand (one hour at 250°F) with a water-repellent material such as Scotch-gard™.

An investigation with Magic Sand:

Materials needed:

- Magic Sand (Available as Mystic Sand, catalog no. AP4304 from Flinn Scientific, Inc.)
- Beach sand or horticultural sand (sharp sand)
- 2 glasses, beakers (250-mL or larger), plastic cups, or paper cups
- spoon or stirring rod
- Water
- oil (household oil or cooking oil)
- paper towels or newspaper
- microscope, 30x or 100x

Safety Precautions:

There are no safety hazards working with Magic Sand

Clean-up:

Magic Sand can be reused as long as it is not contaminated with oil-type materials. Excessive handling will result in the transfer of oils from your skin to the Magic Sand.

After use, pour off as much water as possible. Pour the Magic Sand onto paper towels or open sheets of newspaper. The paper towels or newspaper will absorb any remaining water. Pour the Magic Sand into a storage container such as a jar or plastic zip-lock bag.

Experimental Procedure

Examine some beach or horticultural sand under a microscope. Examine some Magic Sand under a microscope. How do they compare?

Fill two glasses or beakers about half way with water. Sprinkle a small amount of beach sand on the water in one glass. Sprinkle a small amount of Magic Sand on the water in the second glass. What happens?

Add additional beach sand to the glass containing the beach sand. Add additional Magic Sand to the glass containing the Magic Sand. What happens?

Using a stirring rod or spoon, try to move each sample of sand around under the water. Describe what happens.

Spoon some of each sand out of the water and onto a paper towel or some newspaper. Describe what happens.

Pour out the water and collect and save the Magic Sand by pouring it onto some newspaper or paper towels.

Half fill each glass with fresh water. Add a few drops of oil to each glass. Sprinkle a small amount of beach sand in one glass and a small amount of Magic Sand into the second glass. What happens?

Gently stir the contents of each glass. What happens?

Pour off the water and separate the sand. Do not mix the oil contaminated sand with the clean sand.

Time to Experiment:

Now that you are familiar with the properties of Magic Sand, try some experiments of your own. Make underwater shapes, underwater pillars, and whatever your imagination can devise. Using a pan of water, make underwater sand paintings or an underwater city.



Make Your Own Magic Sand:

This procedure can be used to make a simple form of Magic Sand. This will not be permanent.

Materials needed:

- Beach sand or horticultural sand (sharp sand)
- Baking pan
- Spoon or stirring rod
- Scotchgard™ fabric protector spray

Safety Precautions:

Scotchgard fabric protector must be used in a well ventilated area.

Clean-up:

Magic Sand can be reused as long as it is not contaminated with oil-type materials. Excessive handling will result in the transfer of oils from your skin to the Magic Sand.

After use, pour off as much water as possible. Pour the Magic Sand onto paper towels or open sheets of newspaper. The paper towels or newspaper will absorb any remaining water. Pour the Magic Sand into a storage container such as a jar or plastic zip-lock bag.

Experimental Procedure

Preheat an oven to 250°F (120°C).

Place some clean sand in a baking pan. Bake the sand, to remove any water from its surface, for a minimum of one hour.

Remove the sand from the oven and allow to cool.

You can work with the baking pan or you may want to spread the sand on some newspaper in a well ventilated area.

Spray the sand with Scotchgard fabric protector. (Several light coats of Scotchgard are better than a single heavy coat.) Allow to dry. Stir. Spray again. Allow to dry. Stir. Spray for a third application. Allow to dry.

Test your home made Magic Sand using the investigation in the first part of this experiment.

Author's Note: I have not tried coloring the sand with spray paint. If you wish to try this, dry the sand in the oven, allow it to cool, then spray it with a colored paint of your choice. After it has dried completely, spray with Scotchgard as described above.

Magic Sand is a trademark of the Wham-O Mfg. Co., San Gabriel, CA 91778.

Scotchgard is a trademark of the 3M Company,