CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
S0504

Project Title
Rocking and Rolling on Nano-Structured Super-Hydrophobic Surfaces

Abstract

Objectives/Goals
The purpose of this project is to demonstrate a practical method of creating super-hydrophobic surface coatings and then to characterize the movement of water droplets on these coated surfaces for use in three potential applications. In addition, the unanswered question of whether water drops roll or slide on super-hydrophobic surfaces will be resolved.

Methods/Materials
A versatile thin film coating method was developed that used hydrophobic nano-particles, a polymer binder and solvent to create the super-hydrophobic surfaces on plastic films and complex shapes. A goniometer was used to determine the contact angle of water on the surfaces. Roll off angles, the effect of additives to the water drop and answering the question of whether water drops slide or roll on a superhydrophobic surface were conducted using a simple inclined plane.

Results
The contact angle of a 3µl water drop on this super-hydrophobic surface was 168°
The smaller the volume of a water drop, the higher the roll-off angle of the drop.
Water containing ingredients such as sugar, salts, and carbonation roll down super-hydrophobic surfaces.

Conclusions/Discussion
A simple super-hydrophobic surface coating based on a 30-year-old patent was recreated.
It was proven that water drops roll down super-hydrophobic surfaces.
A super-hydrophobic racetrack was built where water drops could complete a vertical loop and jump.
The concept of an improved fog collection device was demonstrated.
A targeted drop shooter was tested.

Summary Statement
The purpose of this project is to demonstrate a practical method of creating super-hydrophobic surfaces and then to characterize the movement of water droplets on these surfaces for use in three potential applications.

Help Received
Dad helped take pictures; Nanosys Inc. supplied materials