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Introductory Chapter: Superhydrophobic Surfaces - Introduction and Applications

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Actually scientists have some disagreements about the relations between superhydrophobicity and anti-icing properties. Some believe that these two are not related to each other; on the other hand, some insist that superhydrophobicity results in anti-icing properties. This disagreement is because there is no specific standard that can be used to evaluate ice adhesion to the surfaces; also, the method of preparing ice for each study is different from the others; so by now, it is not possible to have a definite answer to this matter. The recent studies have helped to get a better understanding about ice formation process on superhydrophobic surface but there is still much left unknown about the nucleation, growth, and adhesion to the surface which need more studies and information in this subject.

3.5. Drag reduction

Drag force is one of the major problems that a solid moving in water such as a ship or submarine faces. This force is resulted from the friction force between water and moving solid surface in the water. Inspired from shark skin, several superhydrophobic coatings were fabricated in order to reduce the drag. As mentioned before, superhydrophobic coatings have some air pockets inside their hierarchical micro- and nanoscale surface structures which will reduce the contact between solid and liquid so that the drag force will dramatically reduce. Drag reduction phenomenon by superhydrophobic surfaces was investigated in various works such as the one reported by Dong et al. [6], where they have fabricated a superhydrophobic coating on a model ship with a large and curved surface by electroless deposition of gold aggregates. The superhydrophobic model ship exhibited a remarkable drag reduction of 38.5% (Figure 6). On a non-coated sample, the friction is just between solid and water, but on a superhydrophobic

![Figure 6](http://dx.doi.org/10.5772/intechopen.85359)
There are three phases, water, solid, and trapped air between these two; so, the friction will be drastically reduced in this situation which is known as the plastron effect.

3.6. Antibacterial properties

Antibacterial properties are essential in biosensors, implants, food packaging, and industrial and marine equipment. For example, one of the main reasons that cause infection in patient after surgery is bacteria that grow on implants. In order to solve this problem, antibacterial coatings that reduce the bacterial adhesion to the surface suitable are used. One research in this regard fabricated the silver nanoparticles on cotton fibers and then modified by the hexadecyltrimethoxysilane to get superhydrophobicity [7]. Antibacterial activity of the samples (inhibition zone formed on agar medium) has been determined as shown in Figure 7. The results showed that the normal cotton samples, exhibit no antibacterial activity, whereas the silver modified cotton surfaces killed all the bacteria under and around them showing a distinct inhibition zone with an average width of 8.78 mm around the samples.

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