

Enhancement of Falling Film Evaporation by Superhydrophilic Photocatalyst

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Summary

The TiO_2 is one of the photocatalyst that has very unique characteristic. The surface coated with TiO_2 exhibits extremely high affinity for water by exposing the surface to ultraviolet ray and the contact angle decreases nearly to zero. On the contrary, the contact angle increases when the surface is shielded from ultraviolet ray. By changing surface wettability using this nature, we can control liquid-vapor phase change phenomena.

We have been developing superhydrophilic heat transfer surface by making use of sputtering process. For this purpose, a specially designed RF-magnetron sputtering device is used for coating of metallic tube surface. Firstly, we found optimum sputtering condition and then studied the change in contact angle of some specimens under the illumination of UV light.

Using some flat samples we performed experiments of droplet evaporation with different contact angles. The angles are controlled by on and off of UV light and we have two different angles of 5 and 52° on the same surface. The size of water droplets is 2.16 and the surface temperature ranges between 50 and 260°C. Especially, the effect of contact angle on wetting limit temperature has been examined. The results are summarized as follows:

- (1) Evaporation time decreases with the decrease in contact angle.
- (2) Wetting limit temperature increases with the decrease in contact angle.