A Study on the Improvement of Contact Angle and Anti-Condensation Performance by Nano-Coating Treatment of Metal Surfaces

Bae, Hyunwoo (School: Incheon Jinsan Science High School)
Kim, Dongmin (School: Incheon Jinsan Science High School)
Sim, Dongmin (School: Incheon Jinsan Science High School)

With the ongoing COVID-19 pandemic, there has been an increased interest in health and well-being, particularly preventing the spread of diseases. To this end, various research on anti-bacterial and anti-viral related nanotechnologies are being conducted. In our study, we were interested in discovering a safe and efficient way to utilize nano-technology on metal surfaces. Often, metals used in windows and finishing materials of buildings result in condensation and mold due to their high thermal conductivity which can cause health issues including respiratory diseases and skin allergy. Thus, we found it important to identify changes in the physical properties through nano surface treatment. We observed seven metal plates made of Cu, Fe, Al, Ti, Zn, Ni, and Pb which were treated with a nano-coating agent. We monitored changes in physical properties and surface contact angle of the metal plates before and after nano surface treatment. We also evaluated the condensation and temperature characteristics of the metal plates upon environmental modifications. When the seven different metal plates were treated with a nano-coating agent, their physical properties improved. The surface contact angle increased by an average of 31.5% from 43.4-74.1º, prior to the nano surface treatment, to 75.1-101.1º. With the exception of Zn and Pb, the surface temperature of the metal plates remained around 0.04-0.43ºC(average of 0.23ºC) higher, confirming that there was an improvement in anti-condensation performance upon nano-coating. Overall, we were able to confirm that nano-coating of metal surfaces results in improvement of surface contact angle and anti-condensation, and thus can be applied to buildings as well as automotive and industrial fields to enhance living environments.