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Analysis of water microdroplet condensation on silicon surfaces TAKUYA HONDA, KENYA FUJIMOTO, YUTA YOSHIMOTO, Univ of Tokyo, KATSUO MOGI, Tokyo Inst. of Tech., IKUYA KINEFUCHI, Univ of Tokyo, YASUHIKO SUGII, Tokyo Inst. of Tech., SHU TAKAGI, Univ of Tokyo, UNIV. OF TOKYO TEAM, TOKYO INST. OF TECH. TEAM — We observed the condensation process of water microdroplets on flat silicon (100) surfaces by means of the sequential visualization of the droplets using an environmental scanning electron microscope. As previously reported for nanostructured surfaces, the condensation process of water microdroplets on the flat silicon surfaces also exhibits two modes: the constant base (CB) area mode and the constant contact angle (CCA) mode. In the CB mode, the contact angle increases with time while the base diameter is constant. Subsequently, in the CCA mode, the base diameter increases with time while the contact angle remains constant. The dropwise condensation model regulated by subcooling temperature does not reproduce the experimental results. Because the subcooling temperature is not constant in the case of a slow condensation rate, this model is not applicable to the condensation of the long time scale (˜several tens of minutes). The contact angle of water microdroplets (˜several μm) tended to be smaller than the macro contact angle. Two hypotheses are proposed as the cause of small contact angles: electrowetting and the coalescence of sub-μm water droplets.

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