Area: Area 7 Performance and Reliability of PV Modules

SOILING BY VOLCANIC ASH FALL ON PHOTOVOLTAIC MODULES AND EFFECTS BY HYDROPHILIC COATING ON MODULE COVER GLASS

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Kagoshima region in southern Japan has an abundant amount of solar irradiance and is a suitable area for a photovoltaic (PV) generation. On the other hand, there is concern that the output power and reliability of PV modules in this region are dropped by the volcanic ash of the Sakurajima volcano. Therefore, quantitative evaluations of the output power and a development of technique for countermeasures against volcanic ash fall are required under volcanic ash fall environment. In order to maximize the output power by restraining accumulation of volcanic ash on PV modules, we clarify PV module’s conditions such as surface fabrication of the cover glass, setting, and so on. In this study, in order to clarify an influence of the volcanic ash fall on output power of PV modules and effects by hydrophilic coating on PV module cover glass, we evaluated the output power characteristics of PV modules by performing an artificial test. The hydrophilic coating is carried out using an inorganic material and makes an anti-soiling layer on the surface of PV module. The output power characteristics of PV module were measured by a solar simulator. Figure 1 shows measured results of output power characteristics of PV modules with the hydrophilic coating and uncoated cover glass when the amount of volcanic ash was changed at various setting angles of PV modules. The volcanic ashes were fallen on PV module through a sieve with mesh opening 45 μm. The vertical axis is a value obtained by normalizing the measured maximum output power of each PV modules with that of uncoated cover glass before ash fall. The horizontal axis is the amount of volcanic ash. From the measured results, the superiority of the hydrophilic coating cover glass was found between the setting angle of 40 to 60 degree, and the most remarkable in the vicinity of 45 degree. Moreover, it was confirmed that the superiority of the hydrophilic coating cover glass increases with an increase in the amount of ash fall. In addition, these measurements were carried out under low humidity and dry conditions. Since it is guessed that the measured results are affected by higher humidity, measurements under various humidity conditions are necessary in future.

![Figure 1: Relationship between maximum output power and amount of volcanic ash.](image)

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