Abstract

Potential induced degradation (PID) is a defect that has a severe effect on the performance of photovoltaic (PV) modules in field conditions. It is caused by leakage currents and the accumulation of sodium ions (Na+) between the anti-reflective coating and the encapsulation. In the experiment reported on here, PID was artificially induced through a PID stress test, where the surface of a poly-crystalline p-type module was covered with an aluminium sheet connected to the positive terminal of a high voltage power supply (1000 V), while the short-circuited module terminals was biased to the negative terminal. This stress test was applied to two similar poly-crystalline p-type modules, A and B, for 48 hours and 20 hours respectively. The duration of the stress test determines the degree of PID severity induced. The length of the test resulted in Module A's power decreasing by 88% and Module B's by 40%. Electroluminescence and current-voltage measurements were taken at regular intervals over a period of more than a year to monitor the natural recovery of the modules. These measurements show that the natural recovery of severe PID modules is possible, but slow. After the test period, the maximum power of Module A and Module B had recovered to 63% and 96% of the original level. PID experienced in the field is generally less severe than for the modules in this study, so PID recovery could be achieved by adopting a process of setting affected strings at open-circuit in turns.