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Investigation the cause of plasma treatment for low temperature annealed dye-sensitized solar cells[1] SHUNGO ZEN, YUTA KOMATSU, RYO ONO, The University of Tokyo — Dye-sensitized solar cells (DSSCs) require annealing of TiO_2 photoelectrodes at 450 C to 550 C. However, such high-temperature annealing is unfavorable because it limits the use of materials that cannot withstand high temperatures, such as plastic substrates. In our previous paper, a low temperature annealing technique of TiO_2 photoelectrodes using ultraviolet light and dielectric barrier discharge treatments was proposed to reduce the annealing temperature from 450 C to 150 C for a TiO_2 paste containing an organic binder. Here, we investigated the cause of plasma treatment via the Nyquist diagram (Cole-Cole plot) of DSSCs. The Nyquist diagram was masured with a frequency response analyzer (NF Corporation, FRA5022) under 100 mW/cm^2 illumination of a calibrated xenon lamp (Hamamatsu L2274, 150W). The lifetime of the electrons, the effective electron diffusion coefficient, and the electron diffusion length of TiO_2 photoelectrodes were determined by analyzing the Nyquist diagrams. As a result of analyzing the Nyquist diagrams, it was shown that plasma treatment can reduce the electron transport resistance and promote the necking of Hot UV annealed TiO_2 nanoparticles.

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