SF-P009

Maskless Chemical Dry Texturing of Silicon Surface using Fluorine Radicals and NO Gas

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High conversion efficiency and low fabrication cost are important issues in photovoltaic industry using silicon materials. Reflection loss of silicon solar cells can be reduced by texturing of the silicon surfaces. Low reflectance of textured silicon surface of solar cells is a critical step to improve the overall cell efficiency to obtain low reflectance of the silicon surface. For this purpose, chemical-dry etching based texturing was one of the main aims of our experiment. In this study, texturing was performed by using maskless chemical dry etching method with single-crystalline p-type Si wafers. We used the fluorine radicals generated from NF_3 remote plasma and NO gas directly injected into the chamber. We could obtain the reflectance as low as 6.5% without the benefit of anti-reflection coating. A maskless texturing technique is expected to significantly impact the cost and performance of Si photovoltaic technology

SF-P010

Quantification of Mixed Self-Assembled Monolayers Using ToF-SIMS and FT-IR Analyses

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A mixed SAM made of two different terminal groups is a useful organic surface since spacing can be easily controlled by changing a relative mole fraction in a mixture solution. In this study, mixed SAMs made by a mixture of $(S(CH_2)_{11}(EG)_3OCH_2O\text{-acetylene})_2$ (Diyne) and $(S(CH_2)_{11}(EG)_3OCH_2O\text{-propene})_2$ (Diene) were produced on gold substrates and measured by using ToF-SIMS and FT-IR. The secondary ion yield ratio of $[AuS(CH_2)_{11}(EG)_3OCH_2O\text{-acetylene}]$ to $[AuS(CH_2)_{11}(EG)_3OCH_2O\text{-propene}]$ was measured for each mixed SAM and plotted as a function of the mole fraction of Diyne to Diene in a SAM solution. The ion yield ratio of a mixed SAM produced from a solution with a mole fraction of 0.5 (i.e., 1:1 mixture) was 0.3, which corresponded well to the ion yield ratio measured from an Eneyne SAM $(\text{acetylene-}OCH_2O(EG)_3(CH_2)_{11}S\text{-}S(CH_2)_{11}(EG)_3OCH_2O\text{-propene})$. Thus it was found that the relative ion yield ratio of 0.3 was due to a different secondary ion formation and not due to the difference in the amount of adsorbates on the surface, nor to the different binding strengths onto the gold surface. The same samples were also analyzed using FT-IR, and FT-IR results were consistent with the ToF-SIMS results, which showed that the ratio of a mixed SAM formed on gold was equal to the mole fraction in the solution. In conclusion, we showed that a mixed SAM with well-controlled spacing can be produced and quantified using ToF-SIMS and FT-IR analyses.