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Carrier transport and trapping in a-Si:H films under plasma processing SHOTA NUNOMURA, ISAO SAKATA, KOJI MATSUBARA, National Institute of Advanced Industrial Science and Technology — Carrier transport is an important factor that determines the performances of solar cells and transistors [1]. It is often limited by carrier trapping, associated with various defects. The defects are created during fabrication processes using various plasmas; however the defect creation kinetics is not known. Here, we demonstrate the detection of the trapped carriers in a-Si:H films under plasma enhanced CVD, and discuss the carrier trapping and defect kinetics. Using an optically pump-probe technique, we detected the trapped carriers in an a-Si:H films during growth by plasma enhanced CVD [2]. An a-Si:H film growing on a glass substrate was illuminated with pump and probe light. The photocurrent induced by the pump was measured throughout the growth and postgrowth annealing [3]. An increment in the photocurrent induced by the pulsed probe was also measured. The trapped carrier density was determined from the increment since it originates from de-trapping of carriers. We found that the trapped carrier density was typically $10^{18}\mathrm{cm}^{-3}$. It was dependent on the growth temperature, and minimized at 473K. Interestingly, the detected trapped carriers were distributed uniformly in the direction of growth, and they were reduced during postgrowth annealing.

[1] S. Nunomura et. al., **Adv. Mater. 26**, 7555 (2014).
[2] S. Nunomura et. al. **AIP Advances 4**, 097110 (2014).
[3] S. Nunomura et. al. **Appl. Phys. Express. 6**, 126201 (2013).

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