高輝度 XAFS グループ

In-situ XAS study on Initial Growth of CdSe nanocrystals Using Microfluidic Cell

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In spite of growing interests, it is still challenging to probe the nucleation process of nanocrystals, due to the short nucleation time and lack of information on the initial stage [1]. We used an *in-situ* EXAFS method for studying the nucleation as well as growth progresses by using a microfluidic cell which converts the time-dependence to the position-dependence. We studied the initial growth of CdSe nanoparticles, by measuring the Se *K*-edge EXAFS spectra along a microfluidic channel and found strong time-dependence of the nucleation growth at the beginning of the reaction. We observed a rapid increase of the reaction yield of CdSe nanoparticles within several seconds starting from TOP-Se solution at 240 °C. A rapid increase of the reaction yield within several seconds was observed. It is found that after injection of starting materials, the nucleation occurs abruptly and the CdSe nuclei concentration reaches the maximum and then declines rapidly. [2]. The results show the promising capability of in-situ EXAFS combined with a microfluidic cell for investigations of nucleation and growth processes of various nanoparticles synthesized in solution [3].

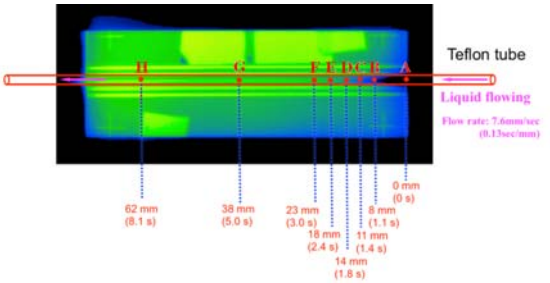

Figure 1. Schematic presentation of eight points A-H along the microfluidic reactor channel as measured in the EXAFS experiment.

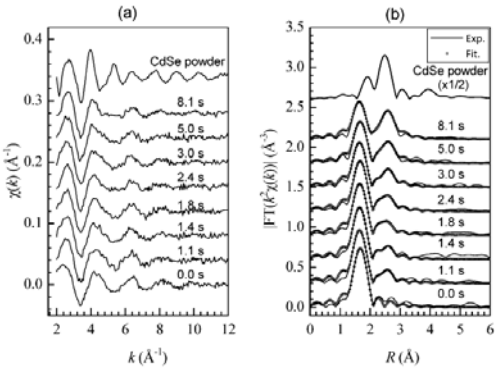

Figure 2. (a) Se K-edge EXAFS oscillation functions (k), and (b) the Fourier transform (FT) magnitudes of the k^2-weighted (k) functions at different heating time t along the microfluidic reactor channel. The EXAFS for CdSe powder measured at room temperature is also plotted as comparison. Spectra have been vertically offset for clarity.

References

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