

Supporting information

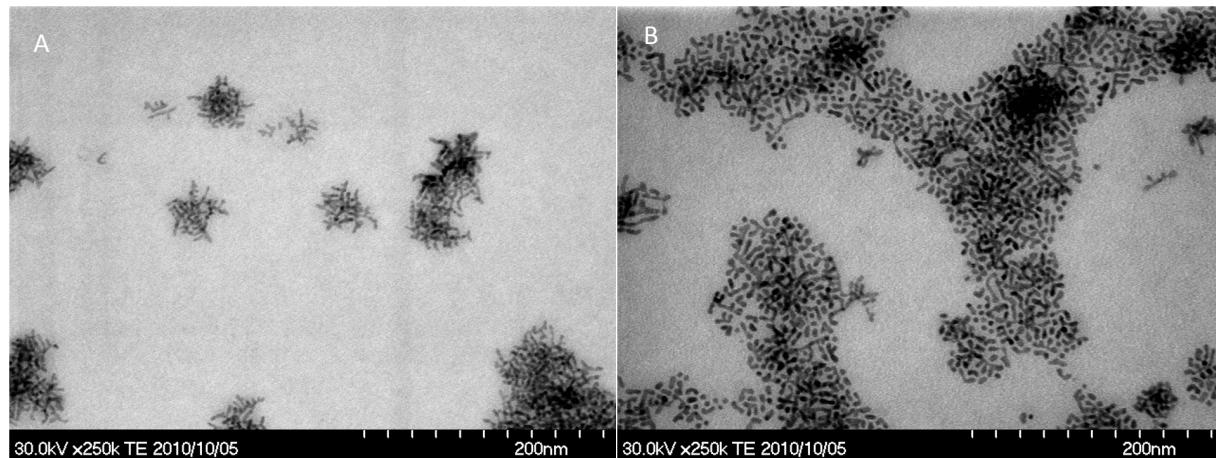
Experiments:

Heating-rate and reaction time controlling. The temperature in the heating-up part was set from 130 °C to 280 °C and the capillary length in this area was 40 cm. The heating rate was controlled by varying the flowing rate of the mixed raw materials. The resident time of raw materials in the temperature gradient zone was depended on the heating rate. With a heating rate of 15 °C/s, 5 °C/s, 2.5 °C/s and 0.83 °C/s, the resident time in the heating-up part was 10 s, 30 s, 60 s and 180 s, respectively. In the case of direct heating-up (1000 °C/s), the mixed raw material was heated-up without temperature gradient zone. The resident time in the aging part was varied to investigate the heating rate effects on the particle growth kinetics. With a given heating-rate, the raw material flowing rate was fixed, and the resident time of raw materials in the aging part was controlled by varying the capillary length, except the case of direct heating-up (1000 °C/s). It has been reported that, the heating rate was not affected by the raw material flowing rate in the case of direct heating¹, as a result, the resident time of raw material in the aging part was controlled by varying the raw material flowing rate in the case of direct heating-up. Detail resident time in the aging part at different heating rate was listed in the following table:

Heating rate (°C/s)	Resident time in the aging part
1000 (°C/s)	30s-600s
15 (°C/s)	20s-120s
5 (°C/s)	60s-180s
2.5 (°C/s)	90s-240s
0.83 (°C/s)	180s-540s

Test experiment of scale-up: Test experiment of scale-up was executed by using a batch reactor with an oil bath heater. In order to investigate the particle growth kinetics, serial aliquots were taken out after a given time when the temperature of the raw materials was heated up to 280 °C. The aging time of the raw material in the batch reactor was varied from 3 minutes to 30 minutes.

Figure S1 STEM images of microreactor with simulated heating curve (20% DDA): A, microreactor 4min; B, microreactor 10 min



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1. H. Nakamura, A. Tashiro, Y. Yamaguchi, M. Miyazaki, T. Watari, H. Shimizu and H. Maeda, *Lab on a Chip*, 2004, **4**, 237-240.