Microreactor with integrated temperature control for the synthesis of CdSe nanocrystals

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Electronic Supplementary Information (ESI)

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Temperature characterization of the microsystem

The microsystem was thermally evaluated using an EMC scanner with an IR Probe (RS321EH, Detectus AB) in order to estimate the temperature distribution.

The isothermal maps of the thermal and fluidic platforms in the xy-axis were recorded, obtaining a uniform radial distribution in all cases. Since the maps were highly similar, only one of them is presented in figure S1, corresponding to the distribution of temperature on the top of the microfluidic platform. The presented isothermal map was obtained by coupling mechanically the microfluidic platform over the heating module, as in the synthesis of nanocrystals, and maintaining temperature in the sensor zone at 270 ºC.

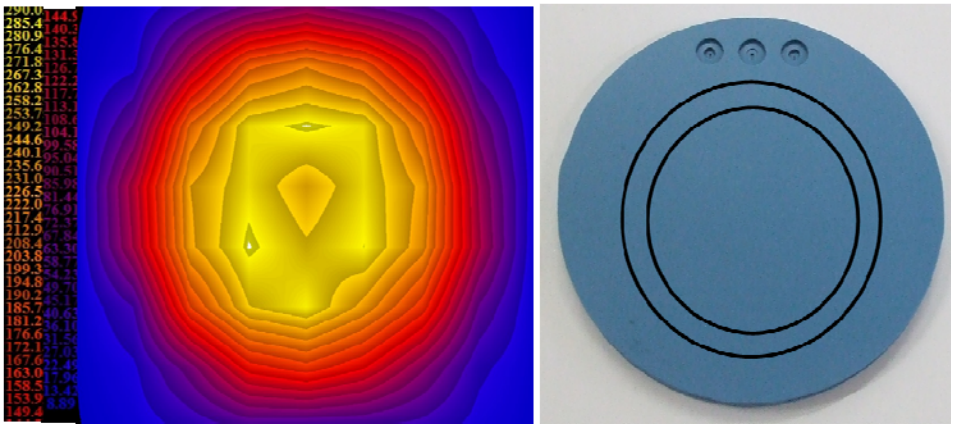

Fig. S.1 (A) Isothermal map obtained for the microfluidic platform coupled to the thermal one; (B) image of the corresponding microfluidic module. The two black circles represents where the microfluidic channels are placed.

To determine the thermal gradient in the z-axis, punctual measurements on the area of the PT100 sensor were performed on both sides of the microsystem (thermal and microfluidic). Temperature was found to be 270ºC and 255ºC on the bottom of the thermal and on the top of the microfluidic platforms, respectively.
Considering the number of layers used for its fabrication and the placement regarding both, the microchannel and the resistor in the microsystem (Figure S.2), a temperature of 268.2ºC can be assumed in the microfluidic channel.

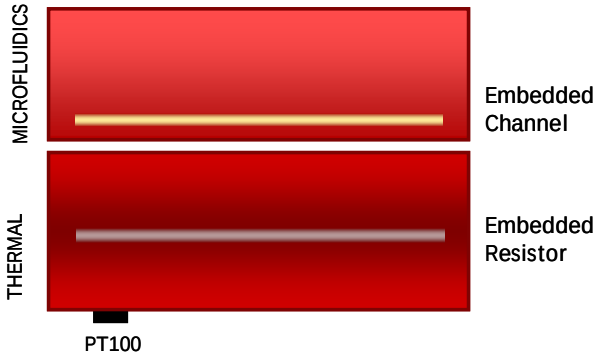

Fig. S.2 Schematic diagram of the temperature analysis developed to estimate temperature in the microfluidic channel.

Supplementary figures

Fig S3: Correlation peaks with temperature

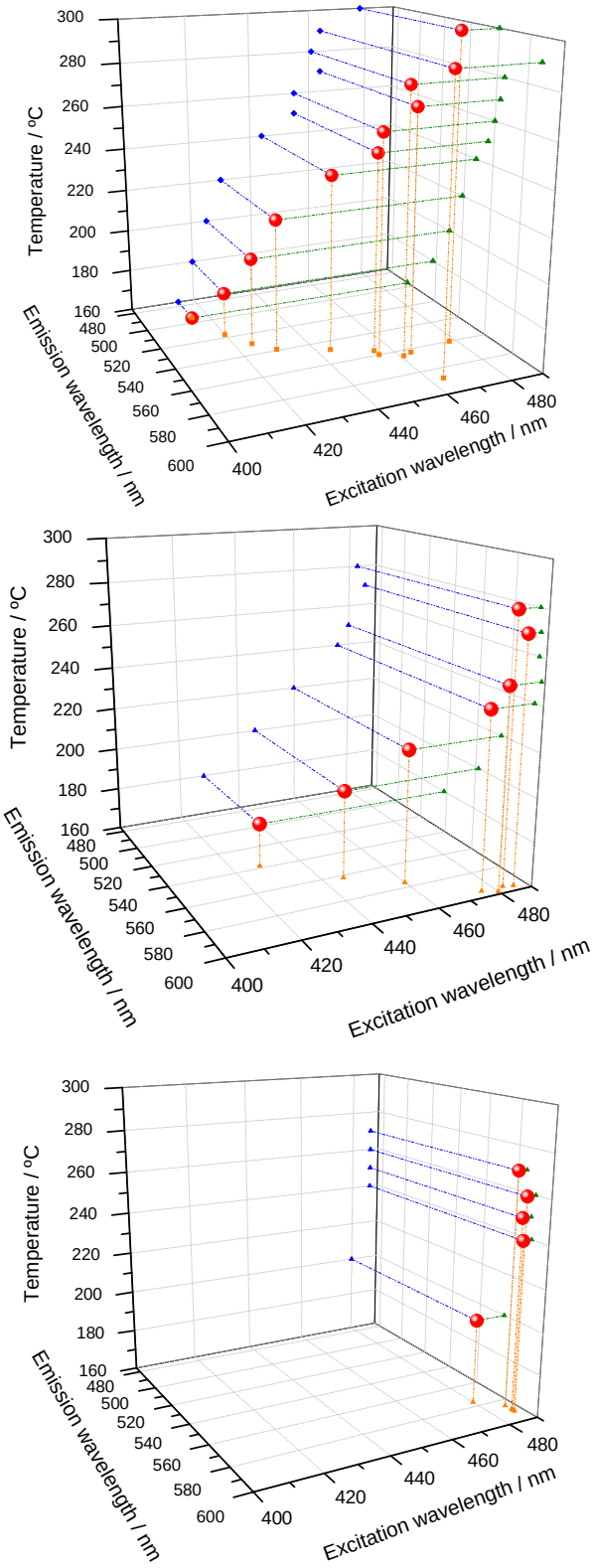

Fig. S.3 Correlation between fluorescence emission peaks, excitation wavelengths and temperatures during the synthesis of nanocrystals with a Cd/Se molar ration of 1:10, 1:1 and 1:2 (from top to bottom).

Fig S4: Stokes shifts

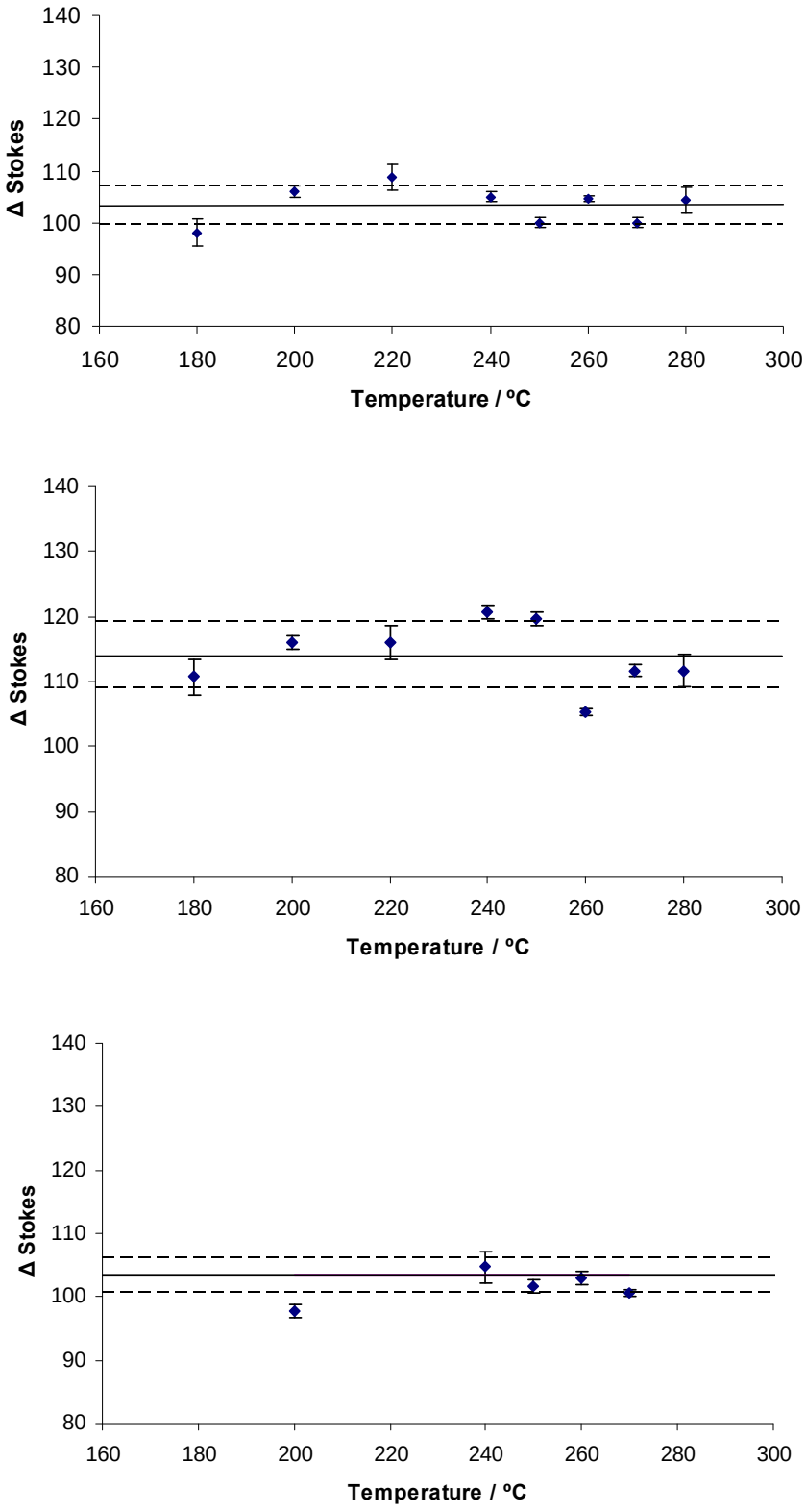

Fig. S.4 Stokes shifts for the synthesized quantum dots at different temperatures and molar relationship of reagents (from top to bottom 1:10, 1:1 and 1:2). The mean value, the standard deviation and the error bars are represented.