

Supporting information

Determination of particle population ratio from experiment 4

Notation

V_{tot} : Total volume of original particles

V_o : Volume of one octahedral particle

V_a : Volume of one amorphous particle

V_{tot}' : Total volume added to the particles by the regrowth

V_o' : Volume added to one octahedral particle by the regrowth

V_a' : Volume added to one amorphous particle by the regrowth

n_o : Number of octahedral particles

n_a : Number of amorphous particles

The total volume of YF_3 in the system is known and distributed among both particle populations:

$$V_{tot} = n_o V_o + n_a V_a$$

Since no new particles are formed, all the material is distributed among existing particles:

$$V_{tot}' = n_o V_o' + n_a V_a'$$

By solving these simple equations we get:

$$n_o = \frac{V_{tot} V_a' - V_{tot}' V_a}{V_o V_a' - V_o' V_a}$$

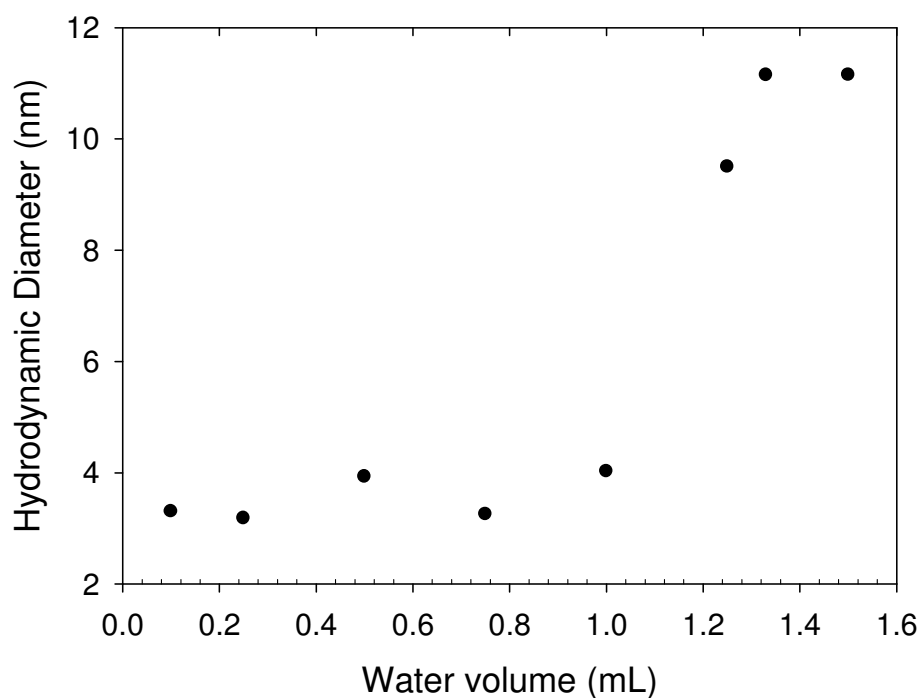
The total volumes of initial and added material are known from the amount of reagent used and the volumes of both particle populations are calculated from TEM size measurements. Therefore, it is possible to calculate the number of particles for both populations. Knowing that, the amount of reagent consumed by each population in the regrowth experiments can also be calculated.

Table 1. Microemulsion water content after each addition for the regrowth experiment^a.

Experiments	Yttrium addition	water content (mL) ^a	Fluoride addition	water content (mL) ^a
Original microemulsion	-	1.00	-	-
1	microemulsion ^b	0.75	microemulsion ^b	0.67
2	aqueous (0.05 mL)	1.05	microemulsion ^b	0.78
3	microemulsion ^b	0.75	aqueous (0.5 mL)	1.00
4	aqueous (0.05 mL)	1.05	aqueous (0.5 mL)	1.55
4b	aqueous (0.1 mL)	1.10	aqueous (0.5 mL)	1.60
4c	aqueous (0.15 mL)	1.15	aqueous (0.5 mL)	1.65

^a This is the water volume per 15 mL of cyclohexane. The surfactant content is the same for all experiments.

^b Added microemulsion contained 0.5 mL water, 2 g surfactant and 15 mL cyclohexane.

**Figure 1.** Hydrodynamic diameter of reverse micelles, measured by DLS, as a function of water volume with 2 g of Igepal CO520 in 15 mL of cyclohexane¹.

(1) Lemyre, J.-L.; Lamarre, S.; Beaupré, A.; Ritcey, A. M., *Langmuir* 2010, 26, (13), 10524.