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Accessory Material

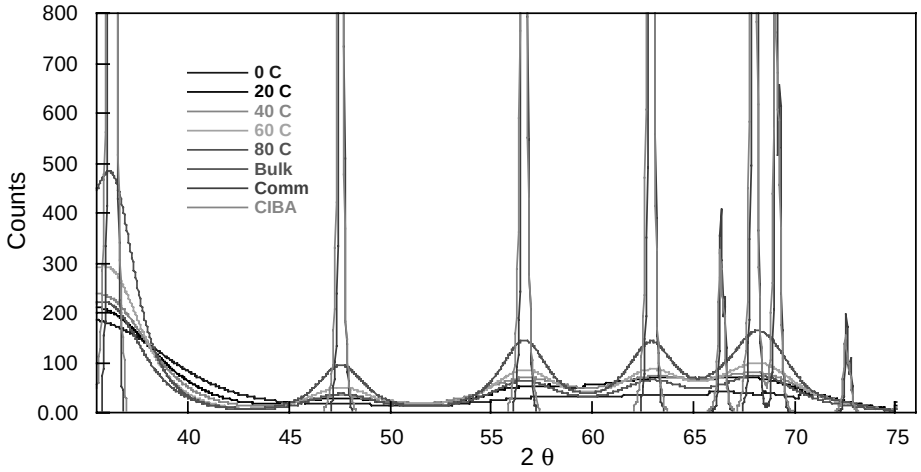

Fig. 1: X-ray diffraction patterns for samples of Q-ZnO between 0 and 80°C, and also heated to resemble bulk ZnO. A commercially obtained sample (Comm) is included for comparison. Note the broadening of the peaks of the Q-ZnO samples.

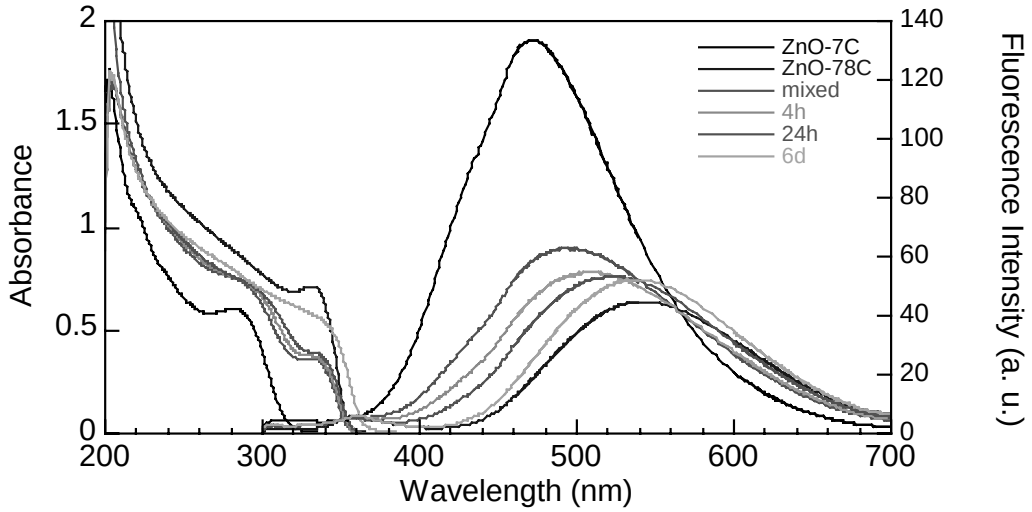

Fig. 2: The absorbance and fluorescence spectra of two 1 mM Q-ZnO solutions, made at 7°C (ZnO-7C) and 78°C (ZnO-78C), and combined at time t = 0 (mixed), 4 h, 24 h, and 144 h. The exciton absorption band of the smaller particles at 300 nm slowly disappears while the absorption band due to the larger particles grows but does not red-shift. This suggests that after 6 days, the smaller particles have grown significantly, but the larger ones have not, which is consistent with Ostwald ripening in the quantum size regime.

Solution temperature [°C]	Exciton peak position [nm]	Ave. particle diameter [Å]
20	288	14
30	300	18
40	305	21
50	309	23
60	316	27
70	323	32
80	322	31

Table 1: The position of the exciton peak for solutions of Q-ZnO made at different temperatures and the average particle size, calculated using the size vs exciton position curve in Figure 5.

Particle diameter [Å]	Fluorescence FWHM [eV]
9	0.70
14	0.57
18	0.58
24	0.53
34	0.64

Table 2: The particle diameter (determined by XRD peak broadening) vs the fluorescence full width half maximum (FWHM). The width of the trap emission is almost independent of size, suggesting that the surface orbitals are isolated and do not mix with the bulk conduction and valence bands.