Example 9-4

A continuous crystallizer containing 100 L of ammonium sulfate slurry is fed with 50 L/h of supersaturated solution. The withdrawal rate of product slurry is also 50 L/h. A nucleation rate of 7.18×10^6 nuclei/Lh and a growth rate of 0.056 mm/h are expected. Assume the crystals are cubic with a density of 1.769 g/cm^3.

Find:

A) The dominant crystal size (L_D)
B) The fraction of the crystals which are equal to and below the dominant crystal size.
C) The number of crystals that are equal to and below the dominant crystal size.
D) The total mass concentration of crystals.
E) The mass of the crystals which are equal to and below the dominant crystal size.
F) The mass fraction of the crystals that will pass through each of the following screens (US Standard): Mesh Size 20, 25, 35, 45, 60, 100.