The Materials Science of Rechargeable Batteries

HW #5

1.Using the reaction zone model, at what porosity, ϵ, does a classic porous electrode of thickness h_c, maximizes the delivered energy?

(a) $\epsilon^* = 1/5$

(b) **(b)** $\epsilon^* = 3/5$

(c) $\epsilon^* = 1/2$

(d) $\epsilon^* = 1$

(e) $\epsilon^* = 1/3$

2. Using the reaction zone model, at what electrode thickness does a classic porous electrode of maximizes the delivered energy?

(a) $h_c^* = \kappa_s U$

(b) $h_c^* = \epsilon^3(\kappa_s - h_s i)/i$

(c) $h_c^* = \epsilon\kappa_s U$

(d) $h_c^* = \epsilon^3(\kappa_s - h_s i)/i$

(e) $h_c^* = \epsilon^{3/2}(\kappa_s U - h_s i)/i$

3. Which of the following is not a valid assumption in the Reaction Zone Model?

(a) All the current density is converted into a reacted charge.

(b) Ohmic limitations are included.

(c) Diffusion limitations are included.

(d) Porosity is uniformly distributed throughout the electrode.

(e) The equilibrium potential is state of charge independent.

4. Which of the following is not a valid assumption in Porous Electrode Theory?

(a) Particles of active material are perfectly spherical.

(b) Ohmic limitations are included.

(c) Phase transformations inside the particles of active material are included.

(d) Diffusion limitations are included.

(e) Transport properties are uniformly distributed.