

The Materials Science of Rechargeable Batteries

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HW #1

For the list of battery systems defined below, select a particle size and electrode layer thickness for each cathode/anode electrode pair to have a charge capacity ratio of 1. For the selected battery parameters, please report the energy density for each battery system for the ideal capacity ratio. Assume that the thickness of the cathode layer is 100 micrometers and the porosity is 35% (for those systems where porosity is relevant).

1. Li-metal | lithium cobalt oxide

- a. 607.5 J/kg b. 453.6 J/kg c. 340.2 J/kg d. 322.2 J/kg e. 390.1 J/kg

2. graphite | lithium iron phosphate

- a. 486 J/kg b. 607.5 J/kg c. 311.8 J/kg d. 390.1 J/kg e. 322.2 J/kg

3. graphite | lithium manganese oxide

- a. 340.2 J/kg b. 607.5 J/kg c. 157 J/kg d. 291 J/kg e. 382.2 J/kg

4. graphite | lithium cobalt oxide thin film

- a. 607.5 J/kg b. 453.6 J/kg c. 486 J/kg d. 291 J/kg e. 675 J/kg

5. Li-metal | lithium iron phosphate film

- a. 607.5 J/kg b. 340.2 J/kg c. 291 J/kg d. 486 J/kg



