What is claimed is:

1. An apparatus for charging a battery, the apparatus comprising:

a. an interface for electrical coupling to the battery;

b. circuitry for concurrently measuring battery voltage and current;

c. a database for accumulating battery parameter data from a plurality of batteries; and

d. a processor for recursively updating data characterizing a model representing the battery based both on jointly measured battery voltage and current and accumulated parameter data received from the database; and

e. a current supply for supplying current for charging the battery as governed by the processor.

2. An apparatus according to claim 1, wherein the processor is adapted for updating a dynamic representation of cell dynamics for the battery based at least in part upon system identification.

3. An apparatus according to claim 1, wherein the processor is adapted for updating a dynamic representation of cell dynamics for the battery based at least in part upon nonlinear system identification.

4. An apparatus according to claim 1, wherein the circuitry for concurrently measuring battery voltage and current includes a four-port configuration.

5. An apparatus according to claim 1, wherein the interface for electrical coupling to the battery is adapted for coupling to reference electrodes of the battery.

6. An apparatus according to claim 1, wherein the processor further comprises an input for receiving a signal from a sensor sensitive to a characteristic of the battery.

7. An apparatus according to claim 1, further comprising a temperature controller for controlling a temperature of the battery.

8. A network for deriving empirical battery model data, the network comprising:

a. a plurality of charging systems, each charging system including a processor and a power supply for supplying current to a separate battery; and

b. a server for receiving data from each of the plurality of processors and for returning updated data with respect to a dynamic representation of cell dynamics for incorporation by each of the plurality of charging systems.

9. A network according to claim 8, wherein the processor of at least one of the plurality of charging systems is adapted for updating a dynamic representation of cell dynamics for the battery based at least in part upon system identification.

10. A network according to claim 8, wherein the processor of at least one of the plurality of charging systems is adapted for updating a dynamic representation of cell dynamics for the battery based at least in part upon nonlinear system identification.

CLAIMS

1. An apparatus for charging a target battery, the apparatus comprising:

a. an interface for electrical coupling to the target battery;

b. circuitry for concurrently measuring voltage and current of the target battery;

c. a database for accumulating battery parameter data from a plurality of other batteries; and

d. a processor adapted to recursively update a dynamic representation of the target battery based both on jointly measured voltage and current of the target battery and accumulated battery parameter data received from the database for the plurality of other batteries; and

e. a current supply for supplying current for charging the target battery as governed by the processor based on the recursively updated dynamic representation of the target battery.

2. An apparatus according to claim 1, wherein the processor is adapted for updating the dynamic representation of the target battery based at least in part upon a system identification technique.

3. An apparatus according to claim 1, wherein the processor is adapted for updating the dynamic representation of the target battery based at least in part upon nonlinear system identification.

4. An apparatus according to claim 1, wherein the circuitry for concurrently measuring voltage and current of the target battery includes a four-port configuration.

5. An apparatus according to claim 1, wherein the interface for electrical coupling to the battery is adapted for coupling to reference electrodes of the target battery.

6. An apparatus according to claim 1, wherein the processor further comprises an input for

receiving a signal from a sensor sensitive to a characteristic of the target battery.

7. An apparatus according to claim 1, further comprising a temperature controller for controlling a temperature of the target battery.

8. A network for deriving empirical battery model data, the network comprising:

a. a plurality of charging systems, each charging system including a processor and a power supply for supplying current to a separate battery of a plurality of batteries; and

b. a server adapted to receive from each of the plurality of processors data obtained from each of the plurality of batteries and to return updated data with respect to a dynamic representation of cell dynamics for incorporation by each of the plurality of charging systems, wherein the updated data are derived at least in part from the data obtained from each of the plurality of batteries.

9. A network according to claim 8, wherein the processor of at least one of the plurality of charging systems is adapted for updating a dynamic representation of cell dynamics for the battery based at least in part upon a system identification technique.

10. A network according to claim 8, wherein the processor of at least one of the plurality of charging systems is adapted for updating a dynamic representation of cell dynamics for the battery based at least in part upon nonlinear system identification.