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Novel Metal Oxide Aerogel / Graphitic Hybrids for Supercapacitive Energy Storage

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Science and Technology Projects

NOVEL METAL OXIDE AEROGEL / GRAPHITIC HYBRIDS FOR SUPERCAPACITIVE ENERGY STORAGE

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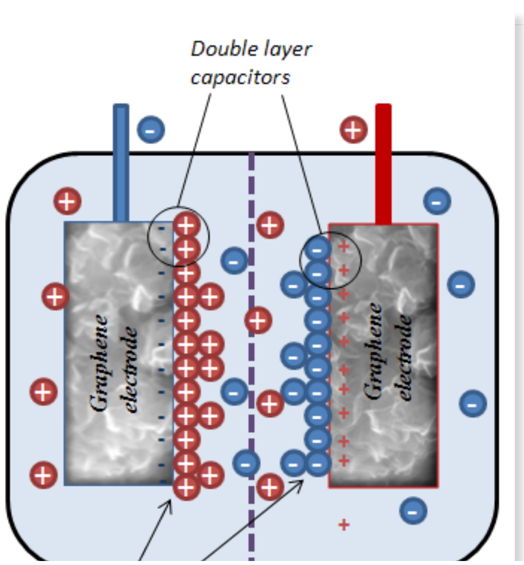
Goal

Create the foundation to develop hybrid metal oxide aerogel/graphitic materials for supercapacitor devices, by preserving high surface area, while presenting significantly higher specific capacitance than carbon by itself due to pseudocapacitive effects.

- Electrical double layer capacitors (EDLC), are based on high surface area carbon materials
  - Stores charges physically using two carbon electrodes separated by an intermediate substance
- They present numerous advantages when compared to battery materials:
  - simple charging methods,
  - very fast rates of charge/discharge,
  - low cost,
  - long cycle life and particularly,
  - high power densities.
- Present relative low values of energy density.
- Go beyond the traditional methods to increase capacity
  - Generate a hybrid, including transition metal oxide (ca. MnO_2, WO_3, NiO) and graphitic component to be used in the form of an aerogel.



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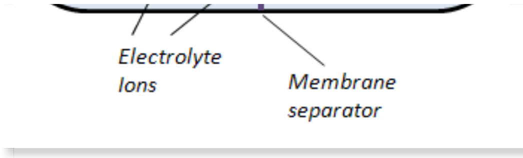

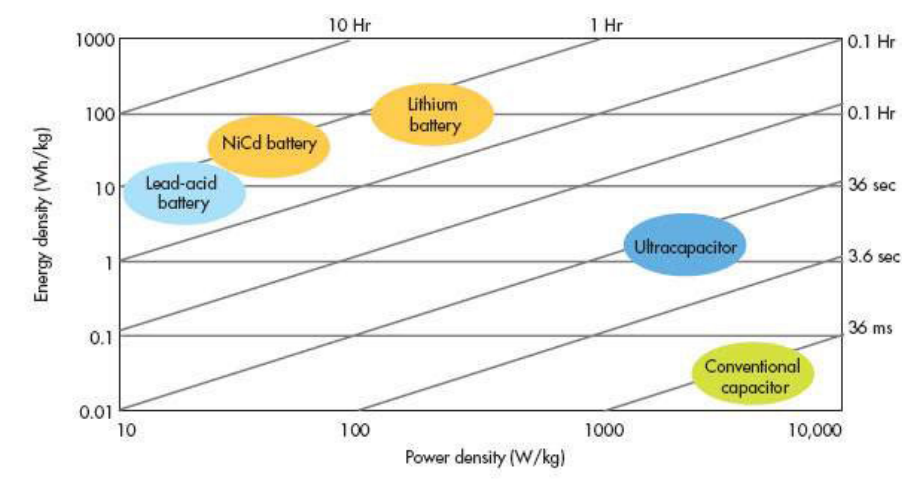

A Ragone chart plots storage device energy density versus power density on a log-log coordinate system, with discharge times represented as diagonals. Among other things, it's handy for comparing batteries and ultracapacitors.

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