continuous monitoring of the visible near-ir absorption spectrum of the polymer. It was also shown that the rate of electrochemical oxidation, (followed by reduction) back to neutral $(CH)_x$ far exceeded the rate-controlling diffusion process of the dopant anions within the polymer. A theory was then developed which showed how high power and current densities could be generated by a $(CH)_x$ battery cell (as found experimentally) despite the slow diffusion and low conductivity characteristics of ionic motion in polyacetylene. The presence of a small driving potential (or a load) causes current to flow and generates a large electric field within polyacetylene fibrils. This field dramatically increases the ion transport rate when the electronic screening length is comparable to or greater than the radius of a fibril.

P-doping (oxidation) and also n-doping (reduction) of $(CH)_x$ was studied by means of electrochemical-voltage-spectrosopy. The results showed that the difference between the voltage characteristic of the onset of electrochemical oxidation and the voltage characteristic of the onset of electrochemical reduction was almost exactly equal to the optical band gap of $(CH)_x$. This showed for the first time how the electrochemical properties of $(CH)_x$ were related to its electronic configuration.

The polymers poly (p-phenylene selenide), $[-(C_6H_4)-Se-]_x$ and poly (2, 5- thienyl selenide) were synthesized. Although the conductivities of these polymers could be increased by doping, their properties did not suggest they would be useful for anode- or cathode-active materials in rechargeable batteries.

(2) <u>Electrochemical Studies of Polyacetylene Directly Related to its Use as an Electrode-Active Material in Rechargeable Batteries in Non-Aqueous Electrolytes.</u>

(A) <u>Use of $[(CH)^{+y})A^-_y]$ as a Cathode.</u> (See in particular, reprints 2, 25 and 19).

The discharge reactions occuring in a Li / $LiClO_4$(P.C.) / $[(CH^{+y})(ClO_4)^-_y]_x$ cell are:

<u>Anode</u> $$(xy)Li \rightarrow (xy)Li^+ + (xy)e^- \qquad (1)$$

<u>Cathode</u> $$[(CH^{+y})(ClO_4)^-_y]_x + (xy)e^- \rightarrow (CH)_x + (xy)(ClO_4)^- \qquad (2)$$