# Photoconductivity of Activated Carbon Fibers

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The photoconductivity is measured on a high-surface-area disordered carbon material, namely activated carbon fibers, to investigate their electronic properties. Measurements of decay time, recombination kinetics and temperature dependence of the photoconductivity generally reflect the electronic properties of a material. The material studied in this paper is a highly disordered carbon derived from a phenolic precursor, having a huge specific surface area of 1000-2000$m^2/g$. Our preliminary thermopower measurements suggest that this carbon material is a p-type semiconductor with an amorphous-like microstructure. The intrinsic electrical conductivity, on the order of 20S/cm at room temperature, increases with increasing temperature in the range 30-290K. In contrast with the intrinsic conductivity, the photoconductivity in vacuum decreases with increasing temperature. The recombination kinetics changes from a monomolecular process at room temperature to a bimolecular process at low temperatures. The observed decay time of the photoconductivity is $\approx$0.3sec. The magnitude of the photoconductive signal was reduced by a factor of ten when the sample was exposed to air. The intrinsic carrier density and the activation energy for conduction are estimated to be $\approx 10^{21}/cm^3$ and $\approx$20meV, respectively. The majority of the induced photocarriers and of the intrinsic carriers are trapped, resulting in the long decay time of the photoconductivity and the positive temperature dependence of the conductivity.

## I. Introduction

Study of the electronic properties of disordered systems is currently an area of active interest. In the case of carbon materials, interesting phenomena have been observed in some disordered carbons, such as Saran carbon