PARAMAGNETISM AND ELECTRON SPIN-LATTICE RELAXATION IN THERMOLYZED POLYPHENYLACETYLENE*

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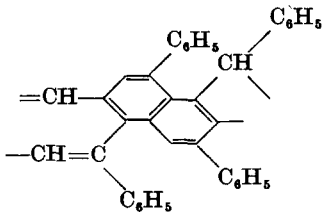
The EPR spectrum of thermolyzed polyphenylacetylene (PPA) is analysed. In the case of low power levels the shape of the EPR spectrum is attributed to the presence of paramagnetic centres localized on structurally different segments of the PPA molecule. Experiments showed the linear dependence of the electron spin-lattice relaxation time T_1 in the temperature range 3–66°K. The experimental values of T_1 are of the same order of magnitude as the calculated values.

This paper relates to an investigation of the paramagnetism and the electron spin-lattice relaxation in thermolyzed polyphenylacetylene (PPA). It is known that heat treatment leads to major structural changes in PPA [1].

EXPERIMENTAL

PPA was prepared by thermal polymerization, then after purging with argon and evacuation to $\simeq 10^{-2}$ mm, underwent further heating for 1 hr at $400 \pm 1°$.

The product obtained may be regarded [1] as a polyene with conjugated bonds. It has acyclic units of the type of $-[CH=C(C_6H_5)]-$, as well as fragments of the type of



The EPR spectra were recorded at room temperature on a THN-251 (Thomson–Houston) spectrometer on a frequency of $\simeq 9{\cdot}5$ GHz. The magnetic field modulation frequency was 4·2 kHz, modulation amplitude 1 gauss and the ultra-high frequency (UHF) power level was varied from 5×10^{-6} to 10^{-1} W.

The spin-lattice relaxation time T_1 was measured by the pulse saturation method, using superheterodyne spectroscopes and frequencies of 6·66 and 28·8 GHz (the first and the second frequencies respectively) in the range 1·6 to 66°K. The saturating pulse width was varied from 1 microsec to hundreds of millisecs, while the pulse repetition frequency was varied from tens to tenths Hz.

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