There appears to be little doubt that the Diels-Alder reaction does not take place with aromatic rings having a high degree of "aromatic character" except in the special cases where a double bond is conjugated with the ring. The polycyclic aromatic hydrocarbons which undergo the reaction—sometimes with unfavourable equilibria—contain either activated meso positions as in anthracene or a relatively fixed and sterically favourable system of double bonds as in perylene. The simple aromatics which react normally are limited to a few highly substituted thiophenes and furan and its derivatives, in which case again the reaction is markedly reversible.

On this view it seemed advisable to investigate a statement by Norton (1942) in a review of the Diels-Alder reaction that a benzene ring of 9, 10-anthraquinone can act as a diene in the reaction and can undergo 1, 4-addition of maleic anhydride. Such a reaction seems unlikely, particularly in view of the similar electron-deficient nature of the benzene rings of anthraquinone and the double bond of maleic anhydride. Norton quotes as authority a paper by Diels and Alder (1929) to which is attributed also an unlikely proof of the structure of the adduct. Perusal of this paper, however, fails to reveal any mention of adduct formation with anthraquinone, and as far as we can discover the subject is not mentioned in any of the works of Diels and Alder. Norton refers also to an observation by Morrell and Samuels (1932), who, in an account of an unrelated investigation, briefly mention that no reaction takes place between maleic anhydride and anthraquinone. These authors make no reference to any previous work on the subject.

In view of the theoretical interest of such a reaction, the following experiments were undertaken in an attempt to isolate an adduct. A range of temperatures was employed since equilibria in adduct formation are considerably affected by temperature. (Bachmann and Kloetzel, 1938.)

1. A solution of anthraquinone (2 g.) and maleic anhydride (10 g., molar ratio 10:1) in benzene was refluxed for eight hours.

2. A solution of anthraquinone (2 g.) and maleic anhydride (10 g.) in nitrobenzene was refluxed for two hours.

3. A melt of anthraquinone (2 g.) and maleic anhydride (10 g.) was held at 200 for two hours.

In all cases both the anthraquinone and the maleic anhydride (as maleic acid) were recovered almost quantitatively and no indications of adduct formation could be found. It is concluded, therefore, that anthraquinone does not react with maleic anhydride in the Diels-Alder reaction.
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