ing that the membranes were permeable to benzene and also that the asymmetry correction was negligible.

The osmotic measurements were made by the static method for attaining equilibrium, and with each solution the rising and falling osmotic heads were measured (see Tables I and III). In each case the original setting of the meniscus was as far from the equilibrium as possible (i.e., since the measuring capillary was 12 cm. long, in one of the measurements the meniscus moved at least 6 cm.) and in practically every case the falling head was equal to or slightly lower than (i.e., some solute diffusion) the rising head. This good agreement between the rising and falling osmotic heads is further confirmation of the semi-permeable nature of these membranes.

With the BASF polystyrene PIII, measurements were carried out at five concentrations from which a value for  $\overline{M}_a$  of 39,000  $\pm$  3000 was calculated (see Table I). By comparison with the data in Meyerhoff's table (see Table II), it appeared therefore that the membranes had a limiting solute permeability of approximately 5000. This was a very surprising conclusion since other membranes of this type had been used to successfully measure an  $\overline{M}_n$  of 2000.<sup>2</sup> Subsequent measurements of reflection coefficients<sup>3</sup> with benzene solutions of (1) pentaerythritol tetrastearate (MW 1200), (2) tristearin (MW 891), and (3) sucrose octaacetate (MW 679), see Table III, confirmed that the limit of solute permeability for these membranes is in fact much lower and is probably in the region of 1000.

It would appear therefore that, while the measurement of the  $\overline{M}_n$  of BASF polystyrene PIII is a useful method for the empirical characterization of semi-permeable membranes (in our own work we use a similar material<sup>3</sup>) in order to estimate the limits of solute permeability it is more satisfactory to measure reflection coefficients of pure chemicals such as pentaerythritol tetrastearate, tristearin, and sucrose octaacetate.

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## On the Oxidation Mechanism of Rubbers in the Presence of Inhibitors

In a recent paper<sup>1</sup> under the above title, Angert and Kuzminskii have reported infrared absorption curves for Nphenyl-2-naphthylamine after oxidation with molecular oxygen, and also for a similarly oxidized extract of rubber containing this inhibitor. On the basis of the spectral results, the authors state that "in both cases one can assume [sic] the formation of the products of the type:"



Angert and Kuzminskii were apparently unaware that experiments carried out in this Laboratory in  $1945^2$  showed that permanganate oxidation of N-phenyl-2-naphthylamine yields a mixture of oxidation products containing N-(2-naphthyl)-N,N'-diphenyl-1,2-naphthylenediamine (Angert and Kuzminskii's assumed product (I)), and also 7-phenyl-dibenzo(c,g)carbazole. More recently, Schneider has shown,<sup>3</sup> through a combination of coupling reactions and paper chromatography, that both (I) and the carbazole occur in naturally aged rubber vulcanizates containing N-phenyl-2-naphthylamine. The presence of (I) in these oxidation products is therefore an established fact, and need not be assumed.

Angert and Kuzminskii also state that the ultraviolet spectra of their oxidation products "were identical, an indication of the absence of any changes in the aromatic nuclei." Since a carbazole is formed in the oxidation reactions, their indication is incorrect. The error probably arose from the fact that Angert and Kuzminskii carried out their ultraviolet examinations on unresolved mixtures of oxidation products. One would therefore expect the results to appear more or less identical, since the ultraviolet spectra<sup>2</sup> of N-phenyl-2-naphthylamine and some of its oxidation products, although they are not identical, nevertheless do not differ strongly.

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