Fig. 4 for different fibers in the dry state and in Fig. 5 for the same fibers in the swollen state.

When the curves are straight lines, this would highly support (although not fully prove) the conclusion of independent scattering by the particles[3]; but this is seldom the case, as Warren and Biscoe[4] for example pointed out in their experiments on carbon black.

The curves of Fig. 4 show that in the case of dry fibers no straight lines are ever obtained. The curves obtained with swollen fibers (Fig. 5), on the other hand, differ from those of dry fibers by being perfectly straight as would be the case when the above assumptions are fulfilled.

The conclusion, therefore, is obvious that due to the swelling process, the particles are so far moved apart that inter-particle interference no longer plays a part, and the calculation of the particle size from the slope of the curves appears permissible. Another important conclusion from the straight shape of the curve is that the size of the particles will not vary to a large extent around an average value.

In Table I the slopes of the curves obtained with different fibers following this new swelling technique are given; these values are proportional to the sizes of the particles in the different fibers, indicating their ratios.

TABLE I

		Radius of gyration, Å.		Diameter, Å.	
Fiber	Slope	a	b	a	b
Jute	218	9.50	7.75	26.87	21.92
Hydrolyzed jute	296	11.07	9.03	31.32	25.54
Flax	313	11.39	9.29	32.21	26.27
Rayon (viscose)	396	12.81	10.45	36.23	29.55
Rayon (fiber G)	396	12.81	10.45	36.23	29.55
Rayon (fortisan)	450	13.65	11.14	38.62	31.50
Ramie	540	14.95	12.20	42.31	34.51

Values for radii of gyration are given in two columns in Table I, one using formula (a) and the other formula (b). The values of the particle diameter given also in Table I were calculated from the two sets of radii of gyration but under the assumption that the particles in both cases have the shape of an elongated cylinder.

(3) If the various assumptions are fulfilled on which Guinier's theory is based, including independent scattering, the theory requires these curves to be straight lines.

(4) J. Biscoe and B. E. Warren, *J. Applied Phys.*, **13**, 364–371 (1942).

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The Loss of Carbon Monoxide from 1,2-Diketones

BY P. H. GORE AND G. K. HUGHES

In a recent communication, G. E. Inglett and G. F. Smith[1] have recorded the formation in almost quantitative yield of 4,5-diazafluoren-9-one by alkaline treatment of 1,10-phenanthroline-5,6-quinone.

They regarded this removal of the elements of carbon monoxide as a "very surprising development," yet the reaction is perfectly analogous to the benzilic acid-type rearrangement[2] of phenanthrene-5,6-quinone, which with fairly con-

(1) G. E. Inglett and G. F. Smith, THIS JOURNAL, **72**, 842 (1950).

(2) J. Liebig, *Ann.*, **25**, 27 (1838); N. Zinin, *ibid.*, **31**, 329 (1839); M. Bösler, *Ber.*, **14**, 323 (1881); L. Gattermann, *Ann.*, **347**, 364 (1906); etc.

centrated alkali gives 9-hydroxy-9-carboxyfluorene[3] and with more dilute alkali fluoren-9-one.[4] The intermediate formation of 9-hydroxy-9-carboxy-4,5-diazofluorene followed by removal of formate ions thus provides an explanation.
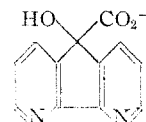
Inglett and Smith further state that this is "the first reaction in which carbon monoxide has been observed to be lost from a 1,2-diketone grouping." However, several 1,2-diketones have long been known to lose carbon monoxide by the action of heat: diethyl 3,4-diketoadipate (ketipinic ester), 2,4,5,7-tetraketoöctane, 1,6-diphenyl-1,3,4,6-tetraketohexane and 1,4-diphenyl-1,4-dicyano-2,3-diketobutane.[5]

It appears from this, and from work carried out in this Laboratory, that for loss of carbon monoxide to occur at temperatures below about 160° (for 2-keto esters) or 250° (for 1,2-diketones), the following grouping should be present, both in 2-keto esters and in 1,2-diketones

$$\text{X}-\text{CO}-\text{CO}-\overset{\overset{\displaystyle R}{|}}{\text{CH}}-\text{Y}$$
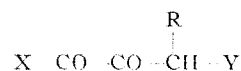
where

X = CHCOR' or OR'
R = H, alkyl or aryl
Y = electron-attracting group

(3) A. Baeyer, *Ber.*, **10**, 125 (1877); P. Friedländer, *ibid.*, **10**, 534 (1877).

(4) R. Anschütz and F. R. Japp, *ibid.*, **11**, 211 (1878).

(5) W. Wislicenus, *ibid.*, **28**, 811 (1895).

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4,4'-Difluorobenzhydrol

BY F. A. GUNTHER AND R. C. BLINN

The authors recently reported[1] the synthesis of 4,4'-difluorobenzhydrol, a compound previously unrecorded in the literature, along with its simple properties and some of its reactions. In February, 1950, Picard and Kearns reported[2] the synthesis of the same compound by a different series of reactions. Whereas our benzhydrol melted at 47.3–47.5°, theirs melted at 92–93°. Rigid comparisons of the two compounds indicate different structures.

In our hands reduction of 4,4'-difluorobenzophenone with zinc and alkali gave the desired benzhydrol (II), whereas attempted reductions by aluminum isopropoxide yielded an unidentified substance (V) in the hands of Picard and Kearns The reaction schemes are as follows:

(1) F. A. Gunther and R. C. Blinn THIS JOURNAL, **72**, 4282 (1950).

(2) Picard and Kearns, *Can. J. Research*, **28B**, 56 (1950).