

INTRAMOLECULAR C-ALKYLATION OF A NITRONATE ANION.

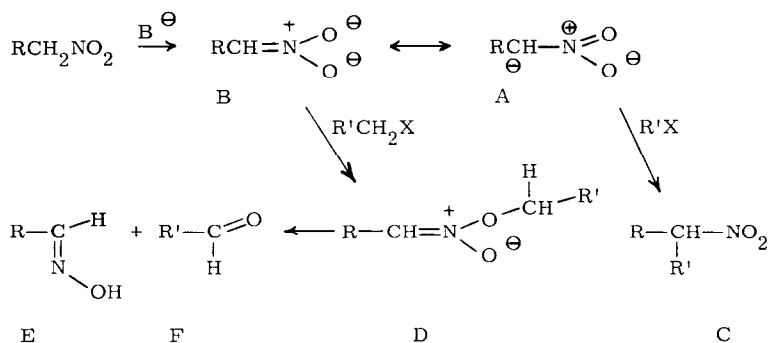
FORMATION OF A BRIDGEHEAD NITRO COMPOUND

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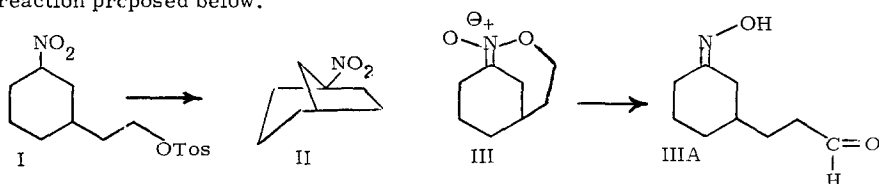
Primary and secondary nitro compounds when treated with base give the ambident<sup>2</sup> nitronate anion  $A \leftrightarrow B$ .<sup>3</sup> This anion may react with an alkylating agent on carbon to give a more highly substituted nitro compound C or on oxygen giving rise to an unstable nitronate ester D which would usually<sup>4</sup> decompose to an oxime E and a carbonyl compound F.<sup>5</sup>



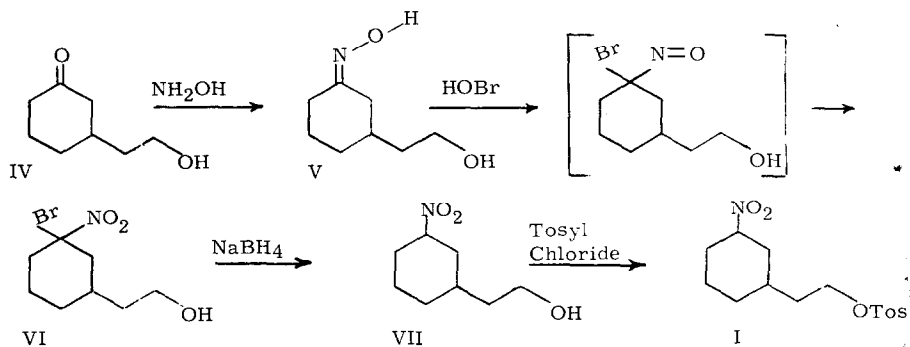
It has been found,<sup>5</sup> however, that in most cases where the alkylation process is irreversible, i. e. with such reagents as diazomethane, alkyl halides alkyl sulphates, benzyltrimethylammonium iodide, and various other onium salts, the products formed are those arising from O-alkylation. Exceptions

have been found only with nitrobenzyl chlorides<sup>6</sup> and with *p*-nitrobenzyltrimethylammonium iodide which give C-alkylation with simple<sup>7</sup> nitroparaffin salts. In contrast, where the process of O-alkylation is reversible, i. e. with aldehydes and ketones,<sup>8</sup> C-alkylation of the nitronate anion occurs.

It occurred to us that C-alkylation of a nitronate anion with a simple aliphatic alkyl halide might be observed if O-alkylation were prohibited or if the route to O-alkylation proceeded through a transition state of high energy. We felt that these conditions would probably be fulfilled in the intramolecular reaction proposed below.



The product of O-alkylation, III, has a double bond at the bridgehead<sup>9</sup> and would be highly strained<sup>10</sup> in addition to requiring a kinetically unfavorable 7-membered transition state. The keto-alcohol IV<sup>11</sup> (b. p. 137° (0.5 mm.); *p*-toluenesulfonate, m. p. 51-52°. Anal. (sulphate). Found: C, 61.05; H, 6.89) was converted to its oxime V (m. p. 105-107°; Anal. Found: C, 61.14; H, 9.67; N, 8.6%) by the procedure of Vargha.<sup>12</sup> Oxidation of V with hypobro-



mite,<sup>13</sup> generated in situ from N-bromosuccinimide and potassium bicarbonate, led to crude bromo-nitro intermediate VI which, on sodium borohydride reduction<sup>14,15</sup> afforded the nitro-alcohol VII, b. p. 90-106° (0.005 mm.). Although VII is unstable, its structure was established by its infrared spectrum;  $\lambda_{\text{max}}^{\text{CHCl}_3}$  2.70 and 2.90 ( $-\text{O}-\text{H}$ ) and  $6.47\mu$  ( $-\overset{\text{H}}{\underset{\text{H}}{\text{C}}}-\text{NO}_2$ ) and by formation of the desired p-toluenesulfonate I, m. p. 64-65°. Anal. Found: C, 55.13; H, 6.64; N, 4.41. Infrared:  $\lambda_{\text{max}}^{\text{CHCl}_3}$  6.47 ( $-\overset{\text{H}}{\underset{\text{H}}{\text{C}}}-\text{NO}_2$ ); 7.35 and 8.48 $\mu$  (tosyl ester).

Treatment of the nitro-tosylate I with sodium hydride in dry dimethylformamide afforded after purification by chromatography and sublimation a 19% yield of 1-nitrobicyclo(3,2,1)octane (II), m. p. 80-81° (sealed capillary). Anal. Found: C, 61.80; H, 8.34. Infrared:  $\lambda_{\text{max}}^{\text{CCl}_4}$  6.54 $\mu$  ( $-\overset{\text{H}}{\underset{\text{H}}{\text{C}}}-\text{NO}_2$ ). In a separate experiment executed in a similar manner, the yield of II was determined by quantitative v. p. c. to be 40%. None of the aldehyde-oxime III-A, the product arising from O-alkylation was detected.

This intramolecular counterpart of C-alkylation of a nitronate anion is of interest as a synthetic approach to systems with nitrogen substituted at a bridgehead.<sup>16</sup>

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16. This work was supported by NIH predoctoral research fellowship number 5-F1-GM-15,527-03.