

AN IMPROVED SYNTHESIS OF RADIOLABELED ACETYLACETONE.

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When radiolabeled acetylacetone is prepared by acetylation of acetone-2-¹⁴C by the conventional method¹, only 16% of the radioactivity is present in the final product. Since the chemical yields are >90%, a large portion of the acetylacetone is formed by self-condensation of the acetic anhydride².

Since a high specific activity was required for preparation of ring-labeled Zectran *, another route for the preparation of radiolabeled acetylacetone was sought. The "inverse addition" (addition of the anhydride and ketone to the BF₃ complex) and "fast saturation" (rapid saturation of solvent with BF₃) procedures³ have been shown to improve the yields of β-diketones. However, the preparation of acetylacetone by this method has not been reported.

Preliminary experiments indicated that the maximum chemical and radiochemical yields are obtained using the above "inverse addition" procedure with a ratio of two moles of acetic anhydride to one mole of acetone. A chemical yield of 79.01% and a radiochemical yield of 75.67% were thus obtained.

EXPERIMENTAL

Ethyl acetate (5 ml) was placed in a 50-ml round-bottom flask equipped with magnetic stirring bar and inlet and outlet tubes. The inlet tube extended to within 1 cm of the ethyl acetate, and a drying tube containing Drierite was attached to the exit tube. The flask and its contents were

*Zectran® insecticide (containing 4-dimethylamino-3,5-xylyl-1-methylcarbamate as the active ingredient) is a broad spectrum insecticide produced by The Dow Chemical Company.

cooled to -10°C with an aqueous salt bath. While the contents of the flask were stirred, anhydrous BF_3 was passed into the flask rapidly for about 15 minutes, a white solid forming at that time. The flask was quickly attached to a vacuum manifold, and 1.883 ml (2.037 mg, 19.97 μmoles) of reagent grade acetic anhydride and then acetone- $2\text{-}^{14}\text{C}$ (580 mg, 9.986 μmoles ; 100 mCi) (New England Nuclear Corporation, Boston, Mass.) were vacuum transferred into the flask. The flask and its contents were allowed to warm to 0°C , and the solution was stirred for 3-4 minutes. After standing overnight at room temperature, the resulting light yellow solution was poured into a 500 ml flask containing a solution of potassium acetate (10.0 g KOAc in 50 ml H_2O). Several water rinsings from the reaction flask were added. The resulting stirred mixture was warmed gradually to 50°C , and then steam distilled. To the receiver containing 60-75 ml of the steam distillate, a hot copper acetate solution (4.0 g $\text{Cu}(\text{OAc})_2$ in 50 ml H_2O) was added. The blue copper chelate precipitate began to form almost immediately. The solution was cooled with stirring in an ice bath for three hours.

Chloroform (40 ml) was added to the aqueous mixture and, after stirring for one hour, the two layers were separated. Additional extractions with 40, 25, and 15 ml of chloroform were performed. The extractions were combined and the solvent removed in vacuo. After drying in a vacuum desiccator overnight, the chelate weighed 1.0336 g (79.01% yield).

For the radiometric analysis, a sample of the chelate was dissolved in chloroform and diluted with ethanol. Using an alcohol scintillator solution prepared from Liquifluor 1X reagent and with internal standards, samples were counted with a Packard Tricarb liquid scintillation spectrometer Model 3324. The radiochemical analysis showed the presence of a total of 75.67 mCi (75.67% yield).

The labeled acetylacetone was isolated by treating the copper chelate with 70 ml of 20% sulfuric acid and 150 ml ethyl ether. After stirring magnetically for 3 hours, the acidic aqueous mixture was continuously extracted with ether for 21 hours. The ether was removed from the extract by dis-

tillation. The isolated acetylacetone was transferred through anhydrous calcium sulfate on a vacuum line. A total of 0.7346 g (7.329 mmoles, 73.29% yield) of acetylacetone-2-¹⁴C was recovered.

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