Calcium oxide catalyzed pyrolysis of N-acyl lactams
by Brent Robert Larsen

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE in Chemistry
Montana State University

Abstract:
A calcium oxide pyrolysis of several N-acyl lactams leads to a useful preparation of some pyrroline and piperidine alkaloids.

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Signature Brent Robert Carlson

Date June 16, 1972

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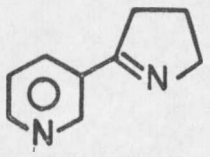
ABSTRACT

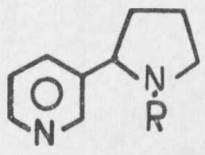
A calcium oxide pyrolysis of several N-acyl lactams leads to a useful preparation of some pyrroline and piperidine alkaloids.

INTRODUCTION

In 1893 workers reported the identification of a class of alkaloid compounds isolated from the tobacco plant genus, Nicotiana.[1] These nicotine alkaloids are assorted derivatives of 2 substituted 3'-Pyridyl pyrroles. These alkaloids were later to become the subject of many synthetic endeavors.



Myosmine



Nornicotine R=H

Nicotine R=CH_3

The first of these endeavors, completed in 1895,[2] was a synthesis of nicotine, the most abundant of the alkaloids. Since then many new avenues have been explored for preparation of these structurally simple but synthetically complex compounds.

Early workers found it necessary to synthesize these alkaloids as a means to unequivocally prove the hypothesized structures stemming from degradative investigations. After the structures of these alkaloids had been well established, interest shifted to synthesis, not to solve fundamental problems, but simply to derive new procedures. In the last decade, chemists' interests have again changed to more versatile synthetic procedures in attempts to label these alkaloids and provide the biochemist with the proper tools for biogenetic studies.

Under the direction of B. P. Mundy, a new approach to the synthetic problem was undertaken by two undergraduates, Lee F. McKenzie and Gary Braden. This new methodology was neither complicated nor elegant. The approach consisted of a pyrolysis of an N-acyl lactam leading to the desired substituted 2-pyrroline. The model system studied to begin this problem, a pyrolysis leading to the preparation of 2-phenyl pyrrolidone, later blossomed into a preparative method far beyond our modest expectations.

This thesis will show the evolutionary refinement of synthetic techniques eventually leading to a relatively simple, high yielding, widely applicable synthesis of pyrrolidine and piperidine alkaloids.