Abstract

This thesis describes the synthesis, characterization and functionalization of pyrimidine-2,4,6-triones (barbituric acids) as well as the corresponding pyrimidine-2-thio-4,6-diones (2-thiobarbituric acids) derivatives.

A series of twelve substituted barbituric acids as well as their corresponding 2-thiobarbituric acid had been prepared in two steps: in the first step was one in which nucleophilic substitution had occurred between diethyl malonate and alkyl halides, acetyl and benzoyl chloride, in the presence of sodium ethoxide or magnesium ethoxide, while aryl halide reacted through cross Claisen condensation. The prepared intermediate compounds include alkyl, aryl, malonyl, acetyl and benzoyl diethyl malonate.

The second step was the enclosure of ring in the above intermediates by means of condensation reaction with urea or thiourea in the presence of sodium ethoxide and absolute ethanol to give the final products. The using of ethane tetra ethyl carboxylic acid as intermediate results in formation of two thiobarbituric acids. The condensation product depend on the ratio of thiourea and the ethane tetra ethyl carboxylic acid; while the replacement of thiourea with urea under the similar above condition failed to achieve condensation reaction.

The reaction courses were followed with thin layer chromatography (TLC). The identity of the products determined through UV, IR and m.p.

A characterization of barbituric acid and 2-thiobarbturic acid derivatives by infrared spectra was investigated, using three characteristic group frequencies: the “secondary amide band” around 3200cm^{-1} and the

bending band around 1550cm^{-1} , the second band is carbonyl stretching vibration around 1750 to 1680cm^{-1} and the third band is enolic O-H band around 3500cm^{-1} . The comparative studies of their infrared spectra with standard sample of phenobarbitone (5-ethyl-5-phenyl-pyrimidine-2,4,6-trione) emphasize the successful synthesis of these compounds.

The dependence of electronic spectra of barbituric acids and thiobarbituric acids on the pH of solution as well as the effect of solvents had been reviewed. It was noticed that all the final products possess ultraviolet spectra in a neutral solution due to ability to ionization of a proton originated in C-5 position and exhibit a beak near 220 – 260 nm, however in alkaline medium their absorption shifted bathochromically to twenty – forty fold due to formation of enolate ions, and these transitions were quenching in acidic medium for some prepared compounds. Certain difficulties were encountered in assigning ultraviolet spectra in pH above 10.

The retro synthetic analysis of compounds was discussed in chapter three together with suitable mechanisms of each different reaction.