CHAPTER I

INTRODUCTION

Carbon paper is the earliest known and most widely used copying paper, which is available at present in different varieties, starting with conventional carbon paper to self regenerating papers with special long standing life. Some leuco-derivatives of basic dyes were used for coating on paper together with a binder like methylcellulose, butyl rubber latex, modified starch etc. As most of the dyes are fugitive to the sunlight and also undergo atmospheric oxidation, it became quite impossible to keep the dyes in colorless form. Moreover, the problem of smudging was always there.

The solution to all these problems such as reversion of color of dyes due to oxidation, smudging and durability of printing marks etc., was achieved by the introduction of pressure sensitive recording paper, carbonless paper. A conventional pressure sensitive recording paper comprises an upper sheet (CB sheet) coated on the back with microcapsules enclosing a solution of color-former, for instance, a leuco-dye and lower sheet (CF sheet) coated on the front with a color developer such as an acid clay or an acidic resin. When the CB sheet is written or typed, the microcapsules are broken upon the pressure so that the contents are transferred to CF sheet, where the color is developed by the interaction of the color-former and the acidic material.

Microencapsulation can be the best described micro-packing techniques that deals with 'packaging' of various liquids, solids and gases in capsules, which alter the basic characteristic on application possibilities of a material. Broadly, microencapsulation provides a mean of packaging, separating, and storing materials on a microscopic scale for later release under certain controlled conditions. Minute

particles or droplets of almost all materials can be enveloped in a thin, uniform film of polymeric material and thus, isolated from reactive, corrosive or hostile atmospheres or surroundings. The choice of release mechanism is usually limited by circumstances of the intended use. Thus, the conditions of release may depend upon moisture, pH, physical force or combinations thereof. The mechanism of release may be associated with leaching, erosion, rupture or the other such actions, depending upon wall construction.

Fundamentally, microcapsules simply contain a tiny amounts of liquids, slurries or solids. Their structure resembles that of a living tissue, consisting of a thin membrane, called "wall" surrounding of discrete amount of matter. Their walls may be wax, natural polymers like gelatin, plastic or metals and their quantity may vary from 20 percent of total capsule weight to almost 100 percent. Microcapsules are measured in micrometers and usually fall into the range of from several to approximately 200 micrometer. The characteristics of the microcapsules wall depend on the chemical and physical processing condition such as type and concentration of constituents as well as the microencapsulation methods. If the other processing conditions are the same, the characteristics of microcapsules depend mainly on the type of wall-forming materials.

The microencapsulation of dye intermediates is performed by various processes. One of the known processes for microencapsulation is the interfacial polymerization by which the reaction of two monomers dissolved in an organic and/or an aqueous phase and when the two reactive materials contact each other at the interface, polymerization occurs and a wall is formed. Examples are polyurea walls formed by reacting an isocyanate with an amine.

The quality and usefulness of a copying paper is also substantially determined by microcapsules that are used. For improvement of efficiency, microcapsules are

required which are excellent in providing image intensity, moisture, thermal and light stability because the carbonless paper tends to use even under severe environmental conditions.

Objective of the research

The objectives of this research were as the following:

1. To investigate the effect of core-to-wall ratios and types of wall materials, HDI and MDI, on characteristic of polyurea microcapsules containing leuco dye prepared by interfacial polymerization technique.

2. To investigate the effect of ethylenediamine (EDA) on characteristic of polyurea microcapsules containing leuco dye prepared by interfacial polymerization technique.

Scope of the research

1. Studying the effect of core-to-wall ratios and types of wall materials to structure of polyurea microcapsules by FTIR and SEM.

2. Studying thermal properties of polyurea microcapsules of different ratios of wall materials, HDI and MDI, by TGA.

3. Evaluation of the quality of microcapsules on coated paper in terms of providing image intensity.

4. Studying the effect of ethylenediamine (EDA) in terms of improving encapsulation efficiency of polyurea microcapsules.

5. Summarizing the results.