CHAPTER 1

INTRODUCTION

1.1 Scientific Rationale

The use of inkjet printer for color printing has widely increased over last decade. Compared to other printing process, inkjet printer has some dominant aspects such as a lower cost of printer and wider color gamut. However, an important weak point of inkjet prints is image permanence under either indoor or outdoor conditions. There are many efforts to increase the light fastness of inkjet prints. The concept of light fastness improvement is to inhibit the photodegrading of the colorants. The first method is to modify an ink formula by adding some important additives such as light stabilizers (LS).[1] These additives exchange the energy from the excited state colorants to the respective additive molecules. Second, the laminated sheet containing hindered amine light stabilizer (HALS) and UV absorber (UVa) is used as external filter for absorbing photon energy.[2] The final method is to modify a recording media. HALS and/or UVa are mixed into an ink receptive layer coated on a printed substrate.

In this thesis, we shall adapt the third method and use a double-layered coating technique. The microporous typed ink-receiving layer will be coated with a solution containing HALS and/or UV absorber. The properties of these stabilizers used in this thesis should be compatible with the aqueous system. In case of the UV absorber, three UV absorbers are selected by their hydrophilic properties, which are soluble in water or other polar solvents such as methanol. However, in case of the HALS, no

effective aqueous-based HALS is found compatible with an aqueous-soluble binder. Therefore, poly(ethylene imine) is used to stabilize the non-aqueous based HALS in the aqueous binder. By this technique, the stabilizer-coated layer also functions as a filter for absorbing light energy and eliminating the free radicals like the second method. So the light stability of inkjet prints should increased without necessity of post printing process such as the lamination method.

1.2 Objectives of the research work

The objectives of this research are to elucidate effects of light stabilizer/UV absorber on light fastness of dye based and pigmented inkjet inks.

1.3 Scope of the research work

This research involves the elucidation of the effect of UV absorber and HALS in coating layers on light fastness of the inkjet inks. Color values in CIE L*a*b* color space are measured before and after the exposure with a xenon weatherometer and ozone testing chamber by a spectrophotometer. The fastness of inkjet ink will be presented in term of color change (ΔE).

1.4 Content of the research work

This thesis consists of 5 chapters including introduction, theoretical background and literature review, experimental, results and discussion, and conclusion and suggestions. Chapter 2 displays a brief of principle of inkjet process, composition and properties of inkjet ink, photodegradation process, light stabilizer and the short literature review of some previous works. In chapter 3, the details about

the materials, apparatus and procedure of this research are explained. Chapter 4 presents the results and discussion of the effect of UVa or HALS coated sheets on light fastness of dye-based inkjet ink, the effect of HALS/UVa coated sheets on light fastness and ozone fastness of dye-based inkjet ink. Moreover, the effect of HALS/UVa coated sheets on light fastness of pigmented inkjet ink is also included.