

Discrimination of Double Strand DNA Based on Doubly Pyrene Modified Cyclodextrins

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In a series of study on development of discriminating agents for single and double strand DNA (ss-DNA and ds-DNA, respectively) based on di-pyrene modified cyclodextrins (CyDs), compound **1** which was modified at A, D of glycopyranose of α -CyD, compound **2** which was modified at A, B of glycopyranose of β -CyD, and compound **3** which was modified at A, D of glycopyranose of γ -CyD, when consisting glucopyranose units of α -, β - and γ -CyDs are lettered from A to F, from A to G and from A to H, respectively, are able to discriminate with ss- and ds-DNA. Discriminating system is realized as behavior of their fluorescent emission intensity in addition of single and double strand DNA

Key Words : cyclodextrins, pyrene, ss-DNA, ds-DNA, fluorescence spectra

1. Introduction

Recently, the genetic diagnosis has attracted significant attention as key of preventive medicine where the fluorescence reagent has been used for DNA detection [1]. However, there are some problems such as "the distinction between ss-DNA and ds-DNA is difficult" and "the longevity of the fluorescence reagent is short and the handling is not easy" in detection with the fluorescence reagent [2]. To solve the problem, we intend to use cyclodextrin (CyD) because CyD has many advantages such as protection or increase of water solubility of organic molecules. When water insoluble organic molecules are bounded with CyD, it will be water soluble compound, because CyD is water soluble material. CyD is tours shaped cyclic oligosaccharides composed of six, seven and eight D-glucopyranose units (α , β , γ -CyD, respectively) [3].

A variety of organic compounds can be included in their center of cavities in aqueous media. Therefore fluorescence reagent can be stable by interaction with CyD cavity. Several years ago, we reported synthesis of pyrene modified β -CyD that was linked between pyrene unit and CyD with polyethylene amine chain [4]. Unfortunately, this compound showed no selective discrimination for ss-DNA and ds-DNA. Recently, another type of bis-pyrene modified CyDs was reported, where pyrene units were bound with γ -CyD as shown in Figure 1 [5]. It showed discrimination capability between ss- and ds-DNA with high selectivity.

For further extension of this work, we synthesized new analogues of di-pyrene modified CyDs (**1**, **2** and **3**), which are bis-pyrene units are introduced into the A, D and A, B and A, D of D-glucopyranose units of α -CyD, β -CyD and γ -CyD, respectively (Figure 2), when consisting glucopyranose units of α -, β -, and

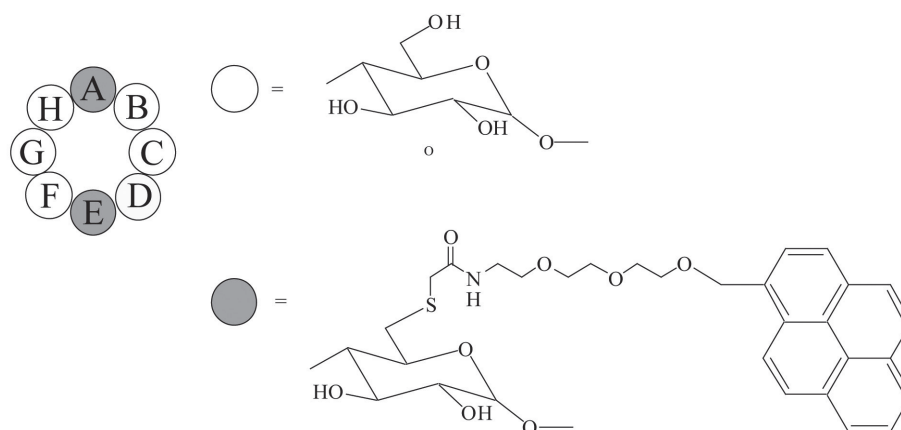


Figure 1 Structure of di-6^A,6^E-deoxy-6^A,6^E-[(8-(1-pyrenemethoxy)-3,6-(dioxo)octa-1-amino)-(thioacetyl)]- γ -CyD.