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### Effect of Hydrogen Bonding Interaction on the Properties of Caprolactam-Modified Casein/Waterborne Polyurethane Composite

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**Keywords** [Hydrogen Bonding Interaction](#), [Modified Casein](#), [Waterborne Polyurethane \(WPU\)](#)

**Abstract** Caprolactam modified casein(CA-CPL) was prepared by using casein and caprolactam firstly. Caprolactam modified casein/waterborne polyurethane composite (CA-CPL/WPU) was prepared from CA-CPL and WPU. Effect of compounding conditions, such as the WPU dosage, compounding temperature and compounding time on CA-CPL/WPU performance were investigated. The results indicated that: CA-CPL/WPU achieved superior comprehensive performance when the WPU dosage was 50%, the compounding temperature and the compounding time was 80°C and 2 h respectively. Viscosity of CA-CPL/WPU decreased firstly with the increasing amount of WPU When the WPU dosage was lower than 30%, and then increased gradually when the WPU dosage was higher than 30%. The more the dosage of WPU used in the reaction, the less dilution stability CA-CPL/WPU had. Acidic resistance, alkali resistance and electrolyte resistance of CA-CPL/WPU seemed to be invariable after WPU was introduced, but water resistance and softness of the film were improved. FT-IR and DLS results indicated that via the compounding process, certain hydrogen bonding interaction in CA-CPL/WPU took place and the obtained CA-CPL/WPU had a small Z-average size and polydispersity.

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### First page example

## Effect of Hydrogen Bonding Interaction on the Properties of Caprolactam-modified Casein /Waterborne Polyurethane Composite

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**Keywords:** modified casein, waterborne polyurethane, hydrogen bonding interaction.

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### Introduction

Casein, of which chemical composition is  $N_{170}H_{268}N_{42}SPO_{51}$ , is a type of natural protein extracted from non-fat milk. As a natural polymer, it is a completely biodegradable and reproducible raw material and has good adhesive force, strong resistance to ironing, grazing and high-temperature. Casein has certain film-forming properties. However, casein film has less extensibility and water resistance and becomes mildey and crazing easily due to its structure<sup>[1]</sup>, so, pure casein cannot satisfy the needs of industry. A single monomer or mixed monomers can be drawn into casein chains after modification, so casein can exhibit various excellent performances because it contains groups such as -COOH, -NH<sub>2</sub>, -OH and so on. At present, modified casein is widely used as a film binding component of the paint, so it has a wide range of applications fields such as in papermaking, printing, coating, leather finishing and other industries<sup>[2-5]</sup>.

The fundamental research and industrial application of waterborne polyurethane(WPU) as a non-flammable and environmentally friendly material has been the drive of the interest of WPU modified with nature polymer like casein. A material composed of WPU and casein in an aqueous solution is believed to improve the properties of casein and still keep the characteristics of the environmentally friendly WPU. PU grafted casein has excellent performances as leather finishing agent<sup>[6-8]</sup> because -NCO of PU can react with some active groups such as -COOH and -NH<sub>2</sub> of casein. Besides, WPU/casein composite prepared via mixing method has good miscibility and improved mechanical properties<sup>[9]</sup>.

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