Received: 30 March 2023 | Revised: 9 June 2023 | Accepted: 30 June 2023

DOI: 10.1111/jfpe.14413

ORIGINAL ARTICLE

Journal of Food Process Engineering WILEY

Interfacial rheology and morphology of casein and non-starch polysaccharides mixed layers at oil/water interface

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Abstract

This work aims to determine the importance of the interfacial attributes on the emulsion stability of casein and five different non-starch polysaccharides (NSPs) and to compare the interfacial rheological properties at the O/W interface. Various interfacial properties of the layers were determined as well as the bulk rheological properties and morphological structures of emulsions. The results of steady interfacial viscosity pointed out that the interfacial film formed by the reaction between casein and lemon fiber had the highest mechanical strength. The molecules of the samples prepared with all other NSPs, except for the emulsions prepared with lemon fiber, were rapidly dispersed and absorbed at the O/W interface, and their G_i' and G_i'' remained nearly constant throughout the test. As a result, it was found that the layers showed non-negligible influences on the interfacial behavior, the amount of NSPs adsorbed at the interface, and the viscoelasticity of the interfacial layers.

Practical applications

This study was conducted considering the interfacial properties of emulsions and evaluated the stability along with the steady and dynamic rheological properties. The obtained results of current study highlighted the importance of determining the interfacial characteristics of non-starch polysaccharides (NSPs) and casein-stabilized emulsions because they can be used to predict the stability of emulsion throughout the shelf life and to get a deeper knowledge on the effects of the NSPs fortification on the emulsion efficiency in food products. A strong positive correlation was found between apparent viscosity and the presence of NSPs. Without NSPs, emulsions were unstable due to depletion or bridging aggregation. The findings are of great importance in understanding the stability and behavior of protein and NSPs-stabilized emulsions. Therefore, the findings of this study will contribute for both the literature and food industry.

KEYWORDS
casein, emulsion, interfacial rheology, non-starch polysaccharides

1 | INTRODUCTION

Casein, the primary protein found in milk, is found in micelles, which are roughly spherical complexes (Horne, 2020). Casein is a rheomorphic protein and the little calcium phosphate particles, which are present with calcium and orthophosphate in casein, help to maintain the structure of the micelles through interactions with hydrophobic and other molecules (Nicolai & Chassenieux, 2021).

