



## Vinyl ester/C-MMT nanocomposites: investigation of mechanical and antimicrobial properties

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### ABSTRACT

Vinyl ester (VE) resins are various applications because of their good resistance excellent and mechanical properties. In this study, red chili particles were incorporated in the sodium montmorillonite ( $\text{Na}^+$ -MMT) structure and the effect of adding new nanoparticles (C-MMT) on the properties of VE was investigated. The C-MMT was characterized using ultraviolet-visible-near infrared (UV-VIS-NIR) and scanning electron microscopy (SEM). The nanocomposites and VE were investigated by SEM, mechanical and antimicrobial properties. The results obtained from UV-VIS-NIR and SEM confirmed the formation of C-MMT and showed that particles of chili were placed between the layers and also on the surface. The presence of chili in the structure created antimicrobial properties. Chili with capsaicinoids groups can disrupt the activities of bacteria. Therefore, the nanocomposite showed inhibitor and killing against *Bacillus subtilis* and *Escherichia coli*. Also, the results showed that *Bacillus subtilis* was more vulnerable to chili. The results of mechanical properties showed that by increasing the C-MMT content, the mechanical properties are improved.

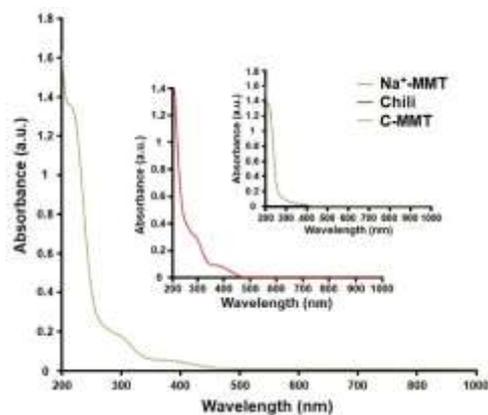
## 1. Introduction

In recent decades, the use of polymer coatings has become very popular. Also, the use of nanofillers such as clay, graphene and carbon nanotubes can improve the properties of coatings [1,2]. In the meantime, resins such as VE, epoxy, and epoxy polysulfide are very popular and used in various fields [3-9]. Good elasticity, high thermodynamic flexibility, high resistance to a variety of solvents, self-healing, and good adhesion for many substrates are important properties of these resins [10,11]. Therefore, they can be used in various applications such as adhesives, coatings, composite materials, insulation, and hoses [12-17].

Here, we were able to incorporate chili particles into the  $\text{Na}^+$ -MMT structure, and then new nanocomposites were prepared using the C-MMT and VE, and the mechanical and antimicrobial properties were investigated.

## 2. Results and Discussion

Chili,  $\text{Na}^+$ -MMT, and C-MMT were investigated by UV-VIS-NIR spectroscopy (see Figure 1).



**Figure 1.** UV-VIS-NIR spectra of  $\text{Na}^+$ -MMT, chili, and C-MMT.

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