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RESEARCH PAPER

Novel Pure Aluminium Silicate Nono Particles As Remeniralizing Fillers for Dental Light Cured Composite: Synthesis and Physicomechanical Properties

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ABSTRACT

This study aimed to assess how the physical and mechanical properties of dental composites are influenced by the characteristics of natural material fillers. We focused on analyzing the filler properties (using XRD, FTIR, SEM, BET, and density) of a selection of glass materials to identify correlations with their physico-mechanical properties and to evaluate the validity of the current classification system. Filler particles measuring less than 500 nm were extracted from five different composites. The surfaces of these fillers were modified with silane before being mixed with a Bis-GMA/TEGDMA (70/30%) resin. We evaluated the physico-mechanical properties of the tested composites, including depth of cure, void content, flexural strength, compressive strength, and fracture toughness. The average size of the fillers was consistently below 1 μm. Flexural strength values ranged from 70.56 to 110.81 MPa, Due to the solid ceramic characteristics of Aluminiumsilicate, certain mechanical properties, like compressibility, may experience a slight increase as the amount of Aluminiumsilicate decreases.

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INTRODUCTION

In order to restore lost tooth structure, dental caries can be treated using a variety of techniques. While invasive procedures entail the removal and replacement of damaged tooth structure with dental restorations, non-invasive techniques aim to stop active non-cavitated carious lesions [1]. Significant developments in dental resin composites over the last 20 years have led to a high level of stability in both their mechanical and cosmetic qualities [2]. Composites dental filling of Resin-based are increasingly utilized for restoration of the tooth due to several advantages over traditional restorative materials, including superior aesthetics, cost-effectiveness, and enhanced physical and wear properties [3]. The classification of dental composites has significantly advanced over the years, traditionally emphasizing filler-size distribution, filler content, or composition. Initially, materials were categorized as micro fills and nano fills, which contained only micro or nanoparticles. However, most contemporary resin composites are classified under the hybrid category, more specifically as nanohybrids. This nomenclature is used to describe materials that consist of a mixture of nanoparticles and submicron particles [4].

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