

Modern polymerizable clay nanoparticles for dental applications: synthesis and structural characteristics

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Nanoclays incorporated in dental composites have been previously investigated. However, limited reports are associated with nanoclays that exhibit high functionality. The aim of this study was the targeted synthesis and characterization of organomodified nanoclays with methacrylic groups suitable for incorporation in dental nanocomposite resins.

For this purpose, quaternary ammonium methacrylates (DMAHDM and DMAODM) were initially synthesized and characterized by means of ¹HNMR and FTIR spectroscopy. Consequently, they were inserted into the interlayer space of nanoclay through a cation exchange reaction, while silane was also used for simultaneous surface modification. The produced organomodified nanoclays (OrgMt) were characterized by means of XRD, FTIR spectroscopy and thermogravimetric analysis (TGA). FTIR spectra confirmed the successful synthesis of the quaternary ammonium methacrylates. The combination of XRD and TGA data disclosed a high degree of intercalation and methacrylated organic loading as well. These phenomena may favor a good dispersion and high polymerization degree of nanoclays with dental resin monomers, rendering them potentially useful materials for the development of advanced dental nanocomposites.

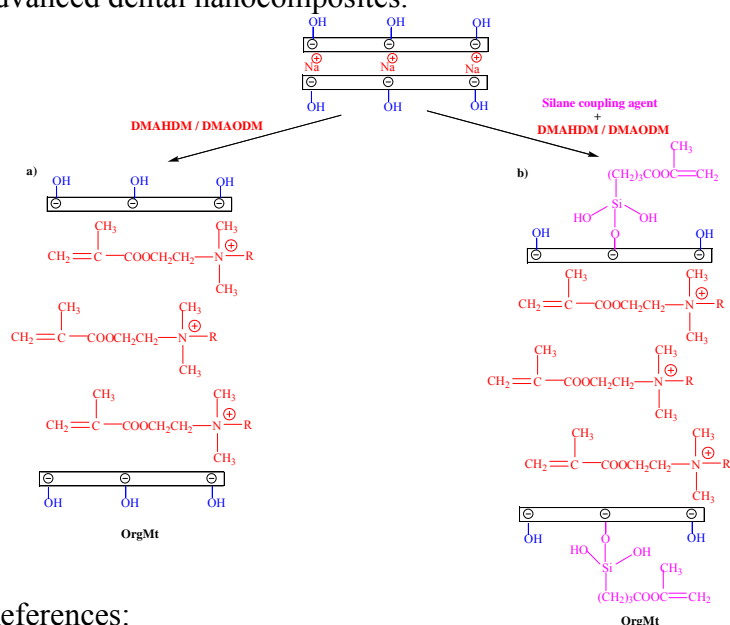


Figure 1: Synthesis procedure of organomodified nanoclays through a) cation exchange reaction and b) silanization followed by intercalated modification, where:

R: $-(\text{CH}_2)_7\text{CH}_3$ or $-(\text{CH}_2)_{15}\text{CH}_3$.

References:

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