A Comparative Study of Selected Properties of Nano Tricalcium-Silicate Cement and ProRoot Mineral Trioxide Aggregate

M.Chenani¹, A.Behnamghader², B.Farzaneh³

¹. Department of Medical Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran.
². Biomaterials group, Materials & Energy Research Center, P O Box: 31488-871, Karaj, Iran.
³. Endodontist DDS MS academic member of aja university of medical science (AUMS), Tehran, Iran.
E-mail: Maryam.chenani@gmail.com

Abstract

The original size, spatial distribution, and composition of nano tricalcium-silicate cement particles have a large influence on hydration kinetics, microstructure development and ultimate properties of cement. This study analyzed and compared the particle size of nano tricalcium-silicate cement and MTA, and then the effects of cement particle size distribution on a variety of performance properties are explored. The particle size of each material was analyzed three times using 0.05 mg of test material with a particle size analyzer. The particle size distribution ranges, the cumulative percentage and the mean of particle sizes were calculated. ANOVA were used for statistical analyses. Properties examined include setting time, bioactivity, hardness, and internal relative humidity evolution. Results demonstrated that the distribution of particles was dissimilar. Particle mean size in the two different materials was not significantly different. Among the various particle size distributions, the particle distribution in the size range of ≤25 μm showed significant difference between materials. Interestingly, The high percentage of small particles found in nano tricalcium-silicate Cement provides desirable properties such as good bioactivity and best setting time.

Keywords: Nano Tricalcium-Silicate Cement, Particle size, bioactivity, Setting time.

References:
Figure 1. SEM of test materials (×10000 Mag.): A) nano tricalcium-silicate, B) MTA.