CHEMICAL, THERMAL AND PARTICLE DISTRIBUTION ANALYSES OF TWO LOW-FUSING DENTAL PORCELAINS

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Abstract

Low-fusing dental porcelains are commonly used for the fabrication of aesthetic restorations to prevent oxidation of NiCrMo, CoCrMo and titanium substructures. The aim of this study was to characterize one feldspar-based commercial porcelain in order to obtain information on the chemical composition, thermal expansion and particle size distribution. Opaque and dentin commercial porcelains have been selected for this purpose. The chemical analyses were carried out by XRD and X-ray fluorescence. The particle size distribution of the porcelains was measured by a particle analyzer associated to the CILAS 2.56 software. Finally, the thermal expansion was characterized by dilatometry. Analyzing the chemical composition, it was observed that the porcelain presented high ZrO_2 content. On the other hand, the majority of the porcelains present larger SiO_2 and K_2O and lower ZrO_2 contents. The XRD diffractograms of the dentine and opaque porcelain samples were similar about presence of the leucite crystalline phase found. The main difference observed between opaque and dentine porcelains was in terms of their opaquer phases. A significant difference in the particle size distribution was observed. The opaque and dentin presented bimodal distribution but the opaque porcelain presented a relatively particle agglomeration. However, the porcelains should have a fine and trimodal particle size distribution which is expected to promote an adequate particle compaction increasing the bulk density and minimizing the porosity after the sintering. Several studies report the importance of a fine and trimodal distribution for one better compaction of particles and reduction of pores in the ceramic microstructure [1, 2]. Results are in accordance with some studies in the literature [1-5]. The thermal expansion between alloy and porcelain was different too. Therefore, the thermal behavior of dental porcelain is important for achieving better metal-ceramic properties of the joint. Mismatch of thermal coefficients between ceramic and metal can weaken the metal-ceramics interface compromising the performance of the restoration.

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