新型以熱塑性彈性體爲基底根管充填材之研發

Preparation and Characterization of Novel Thermoplastic Polyolefin Elastomer Based Root Canal Filling Materials

中文摘要

牙膠針作爲熱垂直擠壓法之根管充填材料，會有冷卻後收縮、器械加熱溫度過高以及操作手續煩雜等等缺點。因此本研究擬將熱塑性彈性體高分子 Engage 當基材，以石墨纖維、氧化鋅當功能性填充劑，將這三種成分按照不同重量百分比，以塑譜儀混煉製備成各種高分子複合材樣品。樣品性質測試內容包括使用熱傳導係數分析儀、熱重分析儀、流變儀、熱機械分析儀等進行樣品的熱傳導係數、熱穩定性、融熔黏度及尺寸大小穩定性等相關物性分析。研究結果顯示對熱塑性彈性體複合材料而言，無機含量的多寡，有益於增加該複合材料的熱傳導特性；若固定 Graphite 時，當 Engage 減少氧化鋅增加時，熱傳導係數有升高的趨勢；在固定 Engage 成分前提下，隨著 ZnO 成分減少，Graphite 比例增加，其熱傳導係數亦跟著升高。無機填充材的增加會顯著的影響複合材料的黏度。Engage 含量相同時，低含量的 ZnO 及高含量 graphite 的複合材黏度會增加。當 Engage 與氧化鋅的含量比值越大時，流動性會趨近於 RealSeal與純的 Engage。相較於 RealSeal與 GP，無機填充劑含量較高的複合材料具較好的熱安定性，高達 100oC 以上。而無機填充劑含量較高的複合材亦具有較良好的尺寸大小穩定性。

英文摘要

As a vertical compaction root canal filling material, gutta-percha suffered from many disadvantages, such as dimensional contraction during cooling, possible thermal degradation due to the overheating when down packing, and requirement of tedious operational procedures. As such, this study used thermoplastic elastomer, Engage, as base material, Graphite and ZnO as functional fillers, and thermally blended these ingredients at different composition to produce composite materials. Thermal conductivity, melt viscosity, dimensional stability and thermal stability of the resulted materials were measured by Hot Disk Thermal Constants Analyzer, Advanced Rheometer, and Thermal Mechanical Analyzer, Thermal Gravimetric Analyzer. The results show the addition of inorganic compounds enhanced the overall thermal conductivity of the composite materials. Among the fillers, graphite had better result on the thermal conductivity. In some cases, the thermal conductivity was 2 to 3 times higher than that of the GP. With increasing of the inorganic fillers/Engage ratio, the viscosity of the composite material increased and came close to that of Real Seal. However, it is still much less than that of GP, indicating the possible easy of operation

of the new materials. Addition of the graphite and zinc oxide enhanced the overall thermal stability of the composite material by more than 100oC, comparing to those of GP and Real Seal. The dimensional stability was improved as the addition of inorganic compounds.