# Fatigue Test and Stress-Life Analysis of Nanocomposite-Based Bone Fixation Device

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**Abstract :** Durability assessment of nanocomposite-based bone fixation device was performed by flexural fatigue tests, for which the changes in the life cycles of nanocomposite samples synthesized by blending bioabsorbable polymer (PLGA) and ceramic nanoparticles (β-TCP) with different ratios were monitored. The nanocomposite samples were kept in a constant temperature/humidity chamber at 37°C/50%RH for varied incubation periods for the degradation of nanocomposite samples under the temperature/humidity stress. It was found that the life cycles were increasing as the incubation time in the chamber were increasing in the initial stage irrespective of sample compositions, which was due to the annealing effect of the polymer. However, the life cycle was getting shorter as the incubation time increased afterward, which was due to the overall degradation of nanocomposites. It was found that the life cycle of the nanocomposite sample with high ceramic content was shorter than the one with low ceramic content, which was attributed to the increased brittleness of the composite with high ceramic content. The changes in chemical properties were also monitored by FT-IR, which indicated that the degradation of the biodegradable polymer could be confirmed by the increased intensities of carboxyl groups and hydroxyl groups since the hydrolysis of ester bonds connecting two successive monomers yielded carboxyl end groups and hydroxyl groups.

**Keywords :** bioabsorbable polymer, bone fixation device, ceramic nanoparticles, durability assessment, fatigue test
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