

## A rolling-ball device for producing surface fatigue and its application to dental materials

### Abstract

A new method of producing and evaluating surface fatigue using a rolling-ball device has been developed. The method involves constraining a rolling ruby ball between the "v" groove of a rotor and the test specimen. The ball applies a compressive stress to the surface of the test material whilst it rolls in a circular pattern across the specimen surface. The fatigue life is defined as the time taken for surface degradation to begin to occur. The method is simple and reproducible and allows fatigue data to be gathered using a relatively small number of specimens. A series of model dental composites having varying filler fractions (23.7-66.4 vol%) were used to assess the potential of the method. The pattern of material loss as well as scanning electron microscopy examination of the damaged surfaces of test specimens confirmed that a fatigue mechanism was responsible for material loss. The fatigue life varied markedly with filler volume fraction being optimized at values in the range 30-50 vol%. Lower and higher volume fractions reduced the fatigue life. Filler silanation significantly improves fatigue life. The results suggest that the rolling ball device will prove useful in comparing the properties of different materials and in the development of improved products.

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### Keyword

COMPOSITE RESTORATIVE MATERIALS; POSTERIOR COMPOSITE; WEAR; LIMITS.

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