

## Author's Accepted Manuscript

Recent advances in understanding the fatigue and wear behavior of dental composites and ceramics

Jamie J. Kruzic, Joseph A. Arsecularatne, Carina B. Tanaka, Mark J. Hoffman, Paulo F. Cesar



PII: S1751-6161(18)30756-2  
DOI: <https://doi.org/10.1016/j.jmbbm.2018.08.008>  
Reference: JMBBM2919

To appear in: *Journal of the Mechanical Behavior of Biomedical Materials*

Received date: 24 May 2018  
Revised date: 6 August 2018  
Accepted date: 8 August 2018

Cite this article as: Jamie J. Kruzic, Joseph A. Arsecularatne, Carina B. Tanaka, Mark J. Hoffman and Paulo F. Cesar, Recent advances in understanding the fatigue and wear behavior of dental composites and ceramics, *Journal of the Mechanical Behavior of Biomedical Materials*, <https://doi.org/10.1016/j.jmbbm.2018.08.008>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

# Recent advances in understanding the fatigue and wear behavior of dental composites and ceramics

Jamie J. Kruzic<sup>1,\*</sup>, Joseph A. Arsecularatne<sup>2</sup>, Carina B. Tanaka<sup>1</sup>

Mark J. Hoffman<sup>1,2</sup>, Paulo F. Cesar<sup>3</sup>

<sup>1</sup> School of Mechanical and Manufacturing Engineering, UNSW Sydney, NSW 2052, Australia

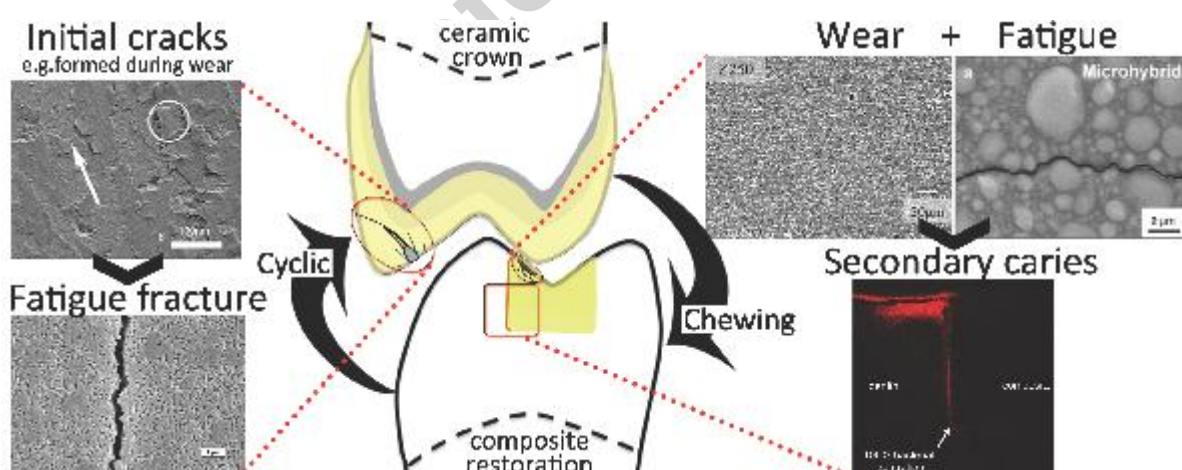
<sup>2</sup> School of Materials Science and Engineering, UNSW Sydney, NSW 2052, Australia

<sup>3</sup> Department of Biomaterials and Oral Biology, School of Dentistry, University of São Paulo, São Paulo, Brazil

## Abstract

Dental composite and ceramic restorative materials are designed to closely mimic the aesthetics and function of natural tooth tissue, and their longevity in the oral environment depends to a large degree on their fatigue and wear properties. The purpose of this review is to highlight some recent advances in our understanding of fatigue and wear mechanisms, and how they contribute to restoration failures in the complex oral environment. Overall, fatigue and wear processes are found to be closely related, with wear of dental ceramic occlusal surfaces providing initiation sites for fatigue failures, and subsurface fatigue crack propagation driving key wear mechanisms for composites, ceramics, and enamel. Furthermore, both fatigue and wear loadings of composite restorations may be important in enabling secondary caries formation, which is the leading cause of composite restoration failures. Overall, developing a mechanistic description of fatigue, wear, and secondary caries formation, along with understanding the interconnectivity of all three processes, are together seen as essential keys to successfully using *in vitro* studies to predict *in vivo* outcomes and develop improved dental restorative materials.

Graphical abstract:



**Keywords:** Fatigue, wear, dental restorations, ceramics, resin composites, enamel, secondary caries

## 1 Introduction

Mineralized tissues make up the load bearing structure of the human tooth. These tissues include enamel, dentin, and cementum, and are all composed of similar building blocks: nanocrystals of

Download English Version:

<https://daneshyari.com/en/article/9952848>

Download Persian Version:

<https://daneshyari.com/article/9952848>

[Daneshyari.com](https://daneshyari.com)