Degradation of Dental Polymers

Jean-François Roulet

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To Trudy, Chantal, Christoph and Marc

Preface

The motivation for writing this book came from my doctorate thesis. In an early phase of the study it became apparent that a comprehensive review on the composition, structure and mechanisms of wear of composite resins was necessary. The review, which is based on the literature available until 1984, provided the material for the first part of this book. Chapters 1-3 cover, in detail, polymer constructions, polymerization mechanisms and wear. Experiments done to help better understand the behaviour of posterior composite materials are described in the second part of the book (chapters 5-8). Clinical data on restorative materials are always more predictive of clinical success than in vitro results. Therefore, clinical experiments were designed to answer questions on wear and marginal behaviour of composite resins. Due to the nature of the clinical experiments, the
results must be comprehensive. To answer very specific questions, it is often advantageous to carry out in vitro experiments. However, predicting the clinical behaviour of dental restorative materials, especially composite materials, based on the classical in vitro data, is presently impossible. This is why the in vitro experiments simulate clinical situations as closely as possible. The chart shows the relationship between the individual experiments. I hoped that the in vivo and in vitro data for the same material would allow us to better understand the in vivo behaviour of the material. A list of references is at the end of each chapter even though some works are, therefore, cited several times. The magnification factor given with SEM photographs corresponds to the original magnification as set on the SEM and not to the true magnification on the printed photograph. This was done because the set magnification is relevant for detail reproduction. However, every SEM photograph has a reference bar to give the reader the correlation to the true dimension. Furthermore, I took great efforts to describe all methods in detail and to mention the source of all materials used. This will hopefully give others the courage to try methods that have been proven to work.

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The road to perfect restorative materials is still long. However, the goal can be attained, and I hope that this book has shortened this road a little.

Berlin, September 1986 Jean-François Roulet

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Abbreviations

ADA American Dental Association
AM Amalgam
AMC Agglomerated microfiller complex
ANOVA Analysis of variance
BDMA Buthylene dimethacrylate
BET Brunauer-Emmett-Teller nitrogen adsorption method
BIS-DMA Bisphenol dimethylacrylate
BIS-GMA Bisphenol glycidylmethacrylate
BPO Benzoyl peroxide
CFA Contact-free area
3-DS Three-dimensional scanner
EGDMA Ethylene glycol dimethacrylate
EM Excellent margin
EMA Ethylmethacrylate
HC Hybrid composite
HMC Homogeneous microfilled composite
IMC Inhomogeneous microfilled composite
IPN Interpenetrating network
ISOBIS-GMA Isobisphenol glycidylmethacrylate
4-META 4-Methacryloxyethyl trimethylsil anhydride
MF Microfiller
MFC Microfilled composite
MMA Methylmethacrylate
MO Marginal opening
MRF Marginal restoration fracture
MTF Marginal tooth fracture
OCA Occlusal contact area
OH Overhang
PL Positive ledge
PMMA Polymethylmethacrylate
SEM Scanning electron microscope
SphPB Spherical polymer-based microfilled complex
SphPP Spherical prepolymerized particles
SPP Splintered prepolymerized particles
SPSS Statistical Package for the Social Sciences
TC Traditional composite
TEGDMA Triethylene glycol dimethacrylate
UDMA Urethane dimethacrylate
UF Underfilled
USPHS United States Public Health Service