



## The role of functional monomer in dental adhesives

Kumiko Yoshihara

National Institute of Advanced Industrial Science and Technology (AIST),  
Health and Medical Research Institute

Adhesive technology has evolved rapidly since it was introduced more than 60 years ago. Today's adhesives either follow an 'etch-and-rinse' or a 'self-etch' approach, which differ significantly in the manner they deal with tooth tissue. Etch-and-rinse approach use phosphoric acid etching and rinsing prior to applying the adhesives.

Different from etch-and-rinse adhesives, self-etch adhesives do not require a separate etching step, as they contain acidic monomers that simultaneously condition and prime the dental substrate. Consequently, this approach has been claimed to be user-friendlier and less technique-sensitive, thereby resulting in a reliable clinical performance. Self-etch adhesives make use of functional monomers that due to their acidic nature etch dentin superficially and so typically provide a submicron micro-retention surface. Functional monomers in adhesive systems can also improve bonding by enhancing wetting and demineralization, and by chemical bonding to calcium. Many different functional monomers have been synthesized and used for self-etch adhesives. Among such functional monomers, the functional monomer 10-methacryloxydecyl dihydrogen phosphate (10-MDP), recently used in more self-etch adhesives and universal adhesives. 10-MDP based adhesive have been known as higher bonding ability in laboratory test and better clinical performance.

In this lecture, we focus functional monomers and discuss the chemical interaction between functional monomer and HAp. This is able to understand the formation mechanism of hybrid layer but also to develop clinical longevity adhesive.

---

### <Curriculum Vitae>

- |                |  |
|----------------|--|
| 2000 – 2006    | Bachelor of Doctor Dental Surgery (DDS), Dental School, Okayama University, Japan.   |
| 2007 – 2010    | PhD student at the Department of Occlusal and Oral Functional Rehabilitation,<br>Graduate School of Medicine, Dentistry and Pharmaceutical Sciences,<br>Okayama University, Japan. |
| 2011 – 2014    | PhD student at BIOMAT, Department of Oral Health Sciences,<br>KU Leuven (University of Leuven), Belgium.   |
| 2014 – 2019    | Assistant Professor at the Center for Innovative Clinical Medicine,<br>Okayama University Hospital, Japan.   |
| 2019 – present | Senior Researcher at Health Research Institute,<br>National Institute of Advanced Industrial Science and Technology (AIST), Japan.   |
| 2019 – present | Visiting researcher at Department of Pathology & Experimental Medicine,<br>Graduate School of Medicine, Dentistry and Pharmaceutical Sciences,<br>Okayama University, Japan.       |
| 2020           | IADR Stephen Bayne Mid-Career Award  |
| 2014           | IADR/AADR William J. Gies Award for the best paper published<br>in the Journal of Dental Research (category Biomaterials & Bioengineering, 2014)                                   |