

PST/PBM-05-2-I-F

## Application of non-thermal atmospheric pressure plasma in dental adhesion

Geum-Jun HAN<sup>1</sup>, Jae-Hoon KIM<sup>2</sup> and Byeong-Hoon CHO<sup>1\*</sup>

<sup>1</sup> *Seoul National University Dental Hospital Dental Life Science Research Institute, Korea*

<sup>2</sup> *Department of Conservative Dentistry, Institute of Oral Health Science, Ajou University School of Medicine, Korea*

---

Abstract: Recently, plasma has attracted increased attention in the biomedical field. Although some types of plasma have already been put to practical use in medicine, more fundamental research on plasma is needed in the biomedical field. The feature of cold plasma, which can interact with subjects physically, chemically, and biologically without causing damage, is very useful in the biomedical field. In this presentation, the applications of plasma technology in dentistry will be introduced. There have been attempts to apply plasma technology in various fields of dentistry including surface modifications of dental implants,<sup>1</sup> adhesion,<sup>2</sup> caries treatment, endodontic treatment,<sup>3</sup> and tooth bleaching.<sup>4</sup> However, relevant research in dentistry is still in its early stages. Besides safety concerns, the fundamental principles of how plasma influences tissues, cells, and the entire living body must be investigated. Nevertheless, the potential value of plasma for dental applications has been demonstrated. Especially in dental adhesion, although there have been great advances of materials and knowledge on the adhesion to tooth substrates and most of current dental adhesive systems show favorable immediate bond strength, their durability after aging remain questionable. Therefore, a new strategy to produce a long-term durable dentin adhesion is needed. Our data on the application of non-thermal atmospheric pressure plasma (NT-APP) and chemical vapor deposition (CVD) to the adhesion and durability of resin composite to dentin will be introduced. Relevant research is underway and plasma has the potential to be innovative in clinical dental practice. To enlarge the scope of plasma applications and put relevant research to practical use, interdisciplinary research with participation of dental professions is required.

### References

1. Hayakawa T, Yoshinari M, Nemoto K. Characterization and protein-adsorption behavior of deposited organic thin film onto titanium by plasma polymerization with hexamethyldisiloxane. *Biomaterials* 2004;25:119-27.
2. Cokeliler D, Erkut S, Zemek J, Biederman H, Mutlu M. Modification of glass fibers to improve reinforcement: A plasma polymerization technique. *Dental Materials* 2007;23:335-42.
3. Jiang C, Chen MT, Schaudinn C, Gorur A, Vernier PT, Costerton JW, et al. Pulsed atmospheric-pressure cold plasma for endodontic disinfection. *IEEE Transactions on Plasma Science* 2009;37:1190-95.
4. Park JK, Nam SH, Kwon HC, Mohamed AA, Lee JK, Kim GC. Feasibility of nonthermal atmospheric pressure plasma for intracoronary bleaching. *International Endodontic Journal* 2011;44:170-5.