https://doi.org/10.17952/37EPS.2024.P1314

清華大學

Key Laboratory of Bioorganic Phosphorus Chemistry & Chemical Biology (Tsinghua University), Ministry of Education

Self-assembled Peptides for Biomimetic Mineralization and Enamel Repair

Yue Li, Rong Chang, Yang-Jia Liu, Feng Chen* and Yong-Xiang Chen*

Yue Li, Rong Chang and Yong-Xiang Chen: Department of Chemistry, Key Lab of Bioorganic Phosphorus Chemistry & Chemical Biology (Ministry of Education), Tsinghua University, Beijing, 100084, P.R. China.
Yang-Jia Liu and Feng Chen: Central Laboratory, Peking University Hospital of Stomatology, Beijing, 100081 China.

Biomimetic mineralization strategy based on self-assembling scaffolds plays a vital role in the formation of highly mineralized organic–inorganic hybrid complexes, which possesses great potential for elucidating the mechanism of biomineralization. Herein, we have developed three self-assembled peptides including a phosphorylated protein segment (LCPS-OP), a phosphonated protein segment (LCPS-CP) and a branched amphipathic polypeptide ($CAMP_{15}$), which are utilized as biocompatible scaffolds to template epitaxial growth of HAP in situ on demineralized enamel surfaces, forming new remineralized enamel layers while reducing the adhesion of *Streptococcus mutans*. These results demonstrate the promising performance of these novel polypeptides in the regulation of biomimetic mineralization interfaces and hold great biomedical potential in the effective repair of defected enamel, as well as in the prevention of dental caries regeneration.

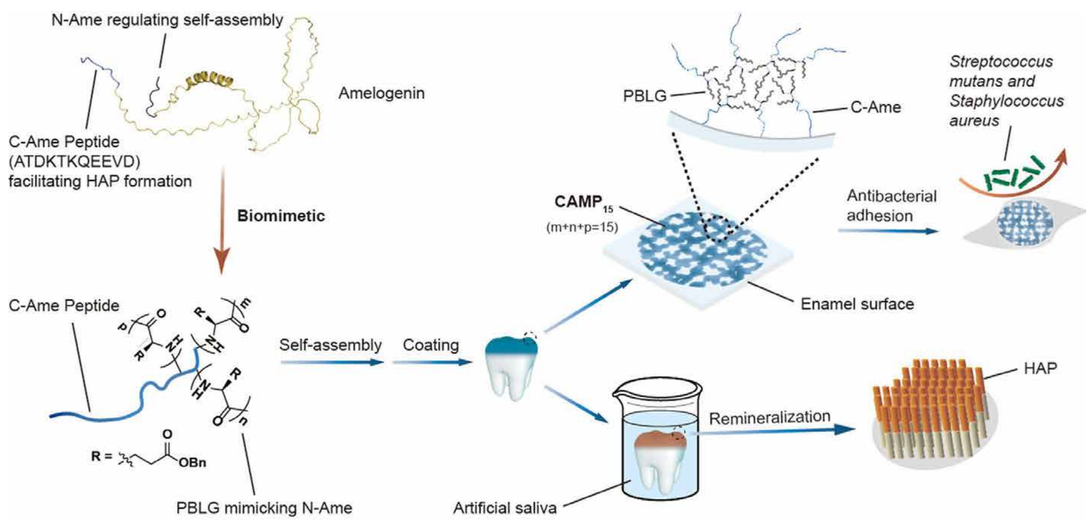

Figure 1. Schematic illustration of a novel self-assembled branched polypeptide ($CAMP_{15}$) as an Ame mimic for enamel repair and antibacterial adhesion.

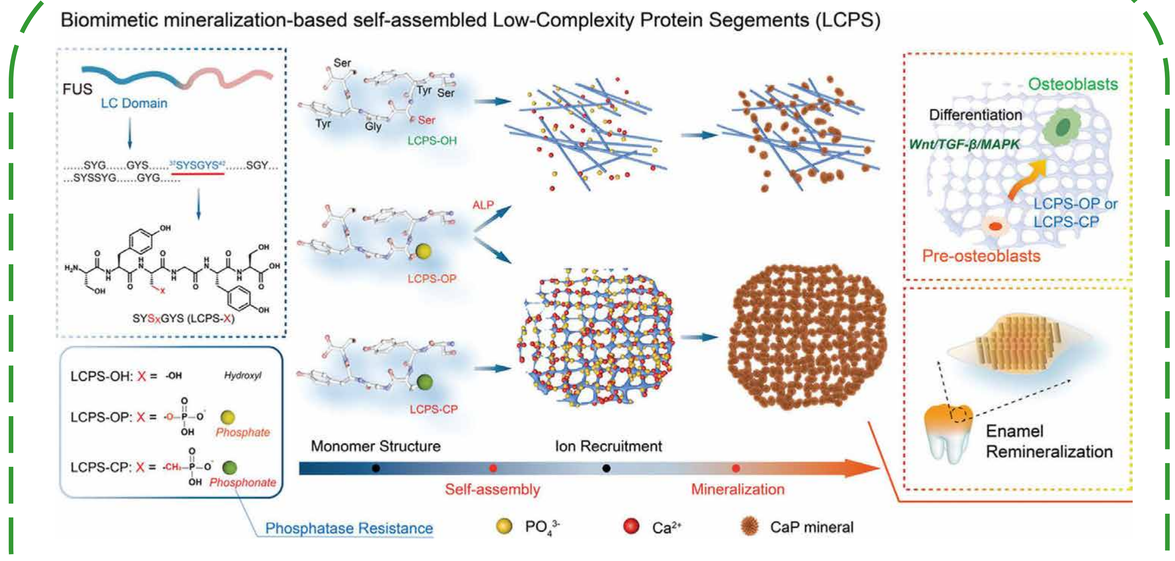

Figure 2. Schematic illustration of phosphorylated and phosphonated LCPSs for biomimetic mineralization and repair of tooth enamel.

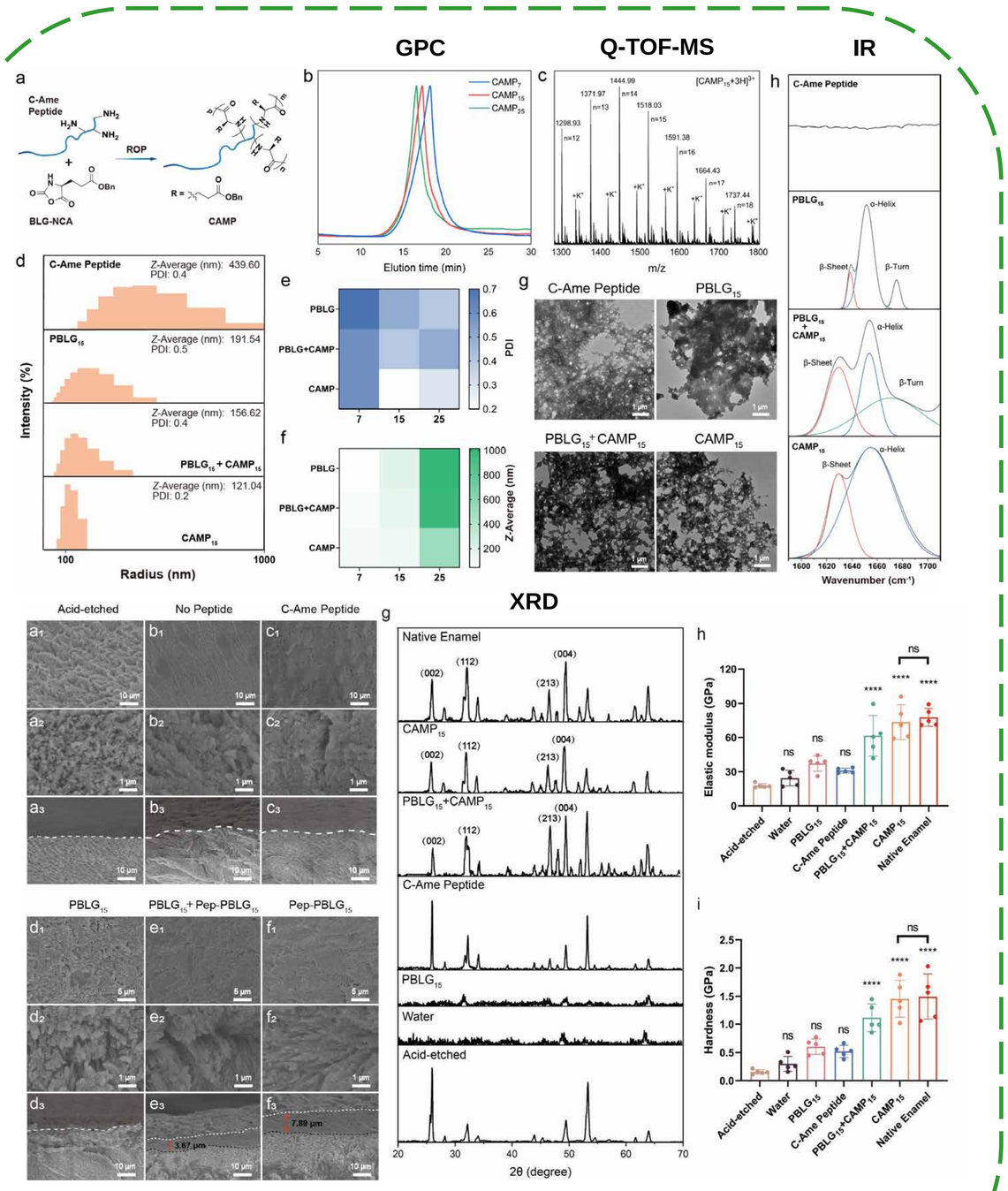

Figure 3. Characterization of CAMPs, PBLG chains and their self-assemblies. Remineralization and repair of acid-etched enamel by using $CAMP_{15}$, $PBLG_{15}$ and C-Ame Peptide assemblies in artificial saliva.

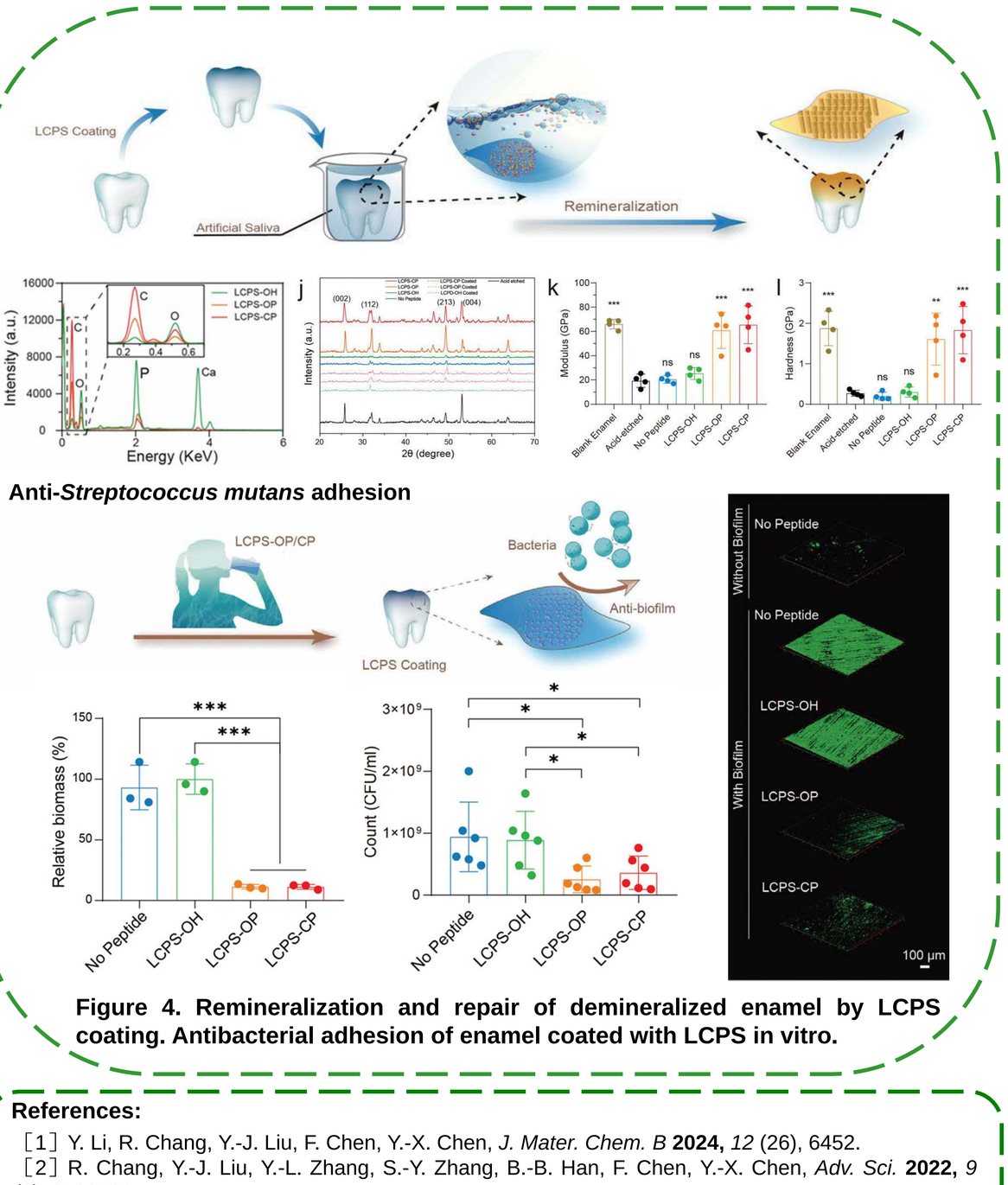

Figure 4. Remineralization and repair of demineralized enamel by LCPS coating. Antibacterial adhesion of enamel coated with LCPS in vitro.

References:

［1］ Y. Li, R. Chang, Y.-J. Liu, F. Chen, Y.-X. Chen, *J. Mater. Chem. B* **2024,** *12* (26), 6452.
［2］ R. Chang, Y.-J. Liu, Y.-L. Zhang, S.-Y. Zhang, B.-B. Han, F. Chen, Y.-X. Chen, *Adv. Sci.* **2022,** *9* (6), 2103829.

Acknowledgements: This work was supported by grants from the National Key R&D Program of China (2021YFC2103900) and National Natural Science Foundation of China (22177059 and 92353302), and the Tsinghua University Initiative Scientific Research Program to Y.X.C.