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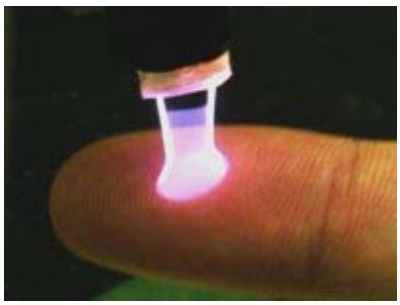
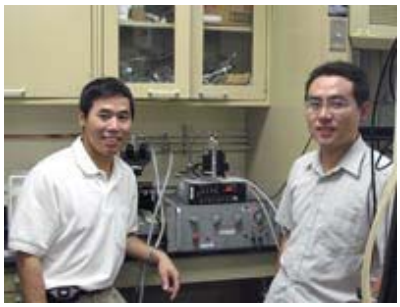
Taking the bite out of dentistry

By Vicki Hodder | Published 12/ NaN / 2007



Dental phobias could soon lose much of their bite if a Mizzou Engineering research team succeeds in its efforts to develop a low-temperature plasma brush that could replace conventional dentist drills.



Mizzou Engineering assistant professors Qingsong Yu, left, and Hao Li are working to miniaturize the plasma source system pictured here to power a plasma dental brush they are developing for dental clinic use.

Qingsong Yu and Hao Li, assistant professors in mechanical and aerospace engineering, are leading a multicampus university research team that has received a $270,000 National Science Foundation grant to lay the theoretical foundation for a plasma dental brush the researchers are developing. The plasma brush would use a low-temperature chemical reaction to disinfect cavities and prepare fillings.

“Plasma treatment would be a painless, nondestructive and tissue-saving way to care for and treat cavities because it relies on chemical reactions instead of heat or mechanical interactions,” Yu said. “And the chemical bonding between teeth and fillings that the plasma treatment would create would be much stronger than you currently get with drills or laser techniques.”

Yu and Los Alamos National Laboratory scientist Yixiang Duan already have filed two U.S. patent applications for the plasma brush, which can change the surface chemistry of its target. While plasma tools are widely used in

materials science and engineering, the plasma brush is unique not only in its shape but in its ability to operate in open air—rather than in a vacuum—and at near-room temperatures, Yu said.

The MU researchers are working on the three-year NSF project exploring plasma dental treatments with Yong Wang, an oral biology associate professor in the University of Missouri-Kansas City's dentistry school.

Wang said the plasma brush the team envisions would cut the time—and the nearly $70.3 billion annual cost, as of 2002—that dentists spend replacing fillings by chemically creating a stronger bond between teeth and fillings. That stronger bond also would extend a tooth's lifetime, since fewer fillings, which often involve removing healthy sections of a tooth, would be required over the years, he said.

"In general dentistry practices, nearly 75 percent of the dentist's time and effort is devoted to replacing fillings that fail prematurely," Wang said. "The premature failure of materials used to repair and replace damaged tissues in the mouth can be traced to breakdown of the bond or seal formed between the filling and the tooth surface."

Moreover, plasma brush dental work would be painless, the research team members predict.

The plasma brush would operate without the vibrations and heat that disturb tooth nerves and cause much of the pain felt during current dental procedures, the researchers said. It also would operate silently, Li said, without the distinctive noise of a drill.

"Successful development of the plasma brush could replace the painful and destructive drilling currently practiced in dentistry," Li said.

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