The vehicle exhaust gas is one of the major causing environmental pollution. It contains a mass of VOC and NOx, which is very harmful to human body. In order to remove pollutants from automotive exhaust, many studies about plasma-driven catalysis for VOC or NOx gas purification have been done. However, heir studies were based on simulated gases (mixed gases or single gas), which were quite different from vehicle exhaust gas, which were quite different from real vehicle exhaust gas from the running car. The complex component from vehicle exhaust will interact with each other during the purification process when catalyzed by plasma.

In this study, the technology of low temperature plasma-driven catalysis of nano-titanium dioxide was applied to the clearance of the vehicle exhaust gas from Cherokee. The device was designed by the principle of coaxial dielectric barrier discharge. The two electrodes were made of copper, while the dielectric was quartz. The nano-titanium dioxide film, attached to the outer wall of the quartz outside the anode, was prepared by the technology of radio frequency magnetron sputtering technique with pressure of 1Pa and power of 150W. Optical emission spectroscopy showed that wavelength of plasma emission light varied from 318nm to 380nm, which satisfied the need of the catalysis of nanotitanium dioxide. The exhaust gas analyzer was used to detect the exhaust content of different ingredients after the treatment, respectively. In comparison with the untreated exhaust, the contents of both NO and HC fell down obviously after the treatment of the synergy of low temperature plasma and catalysis of nano-titanium dioxide.

Then we explained the result through the detection of the active species by optical emission spectroscopy. This result showed that the plasma-driven catalysis technology has a practical and energy-saving significance for the vehicle exhaust gas clearance.

* Work supported in part by Bioelectrics Inc. (U.S.A.), the Peking University Biomed-X Foundation and China International Science and Technology Cooperation (2008KR1330 - “Cold Plasma induced biological effect and its clinical application studies”)*