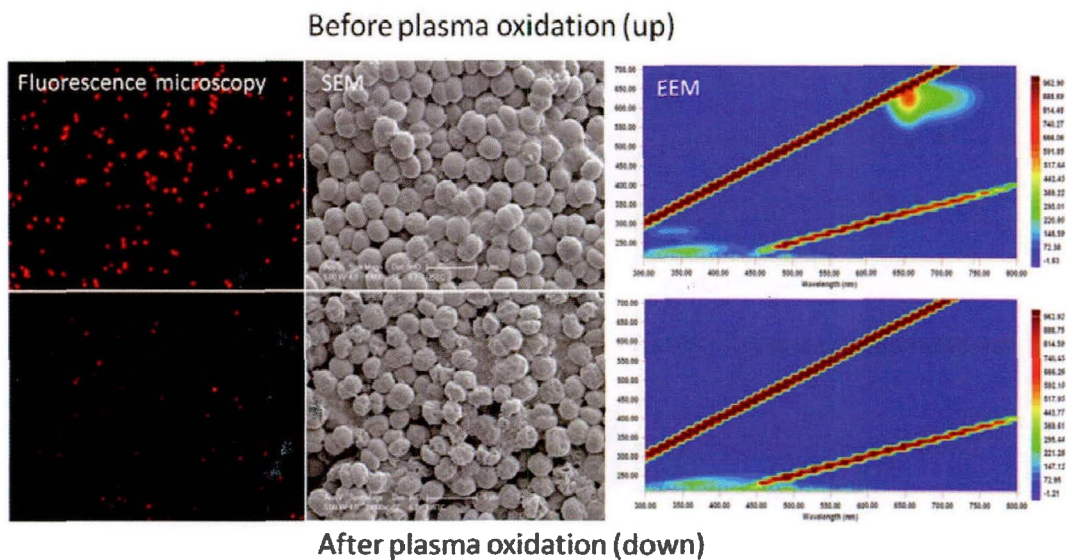


## Treatment of *M. aeruginosa* contaminated water by plasma discharge

Recently, Prof. Huang Qing's group at the Institute of Technical Biology & Agriculture Engineering (Hefei Institutes of Physical Science, Chinese Academy of Sciences) have utilized non-thermal plasma discharge to treat wastewater which contains *M. Aeruginosa*, a major pollution source for cyanobacterial blooms. The work was published in *J Hazardous Materials* (2014, 268: 33—42), with the support by the National Natural Science Foundation of China and the Hundred Talents Program of the Chinese Academy of Sciences.

During cyanobacterial blooms, *M. aeruginosa* can release microcystins which are very toxic and do harm to human health. Yet it is still a challenge to treat the algae contaminated water effectively. Non-thermal plasma discharge is a conventional way to generate low-energy and charged particles with energy in the range of  $0-10^4$  eV depending on specific plasma discharge setup and the voltage applied, and the energetic particles can collide with water molecules to produce reactive oxygen species (ROS) and radicals that can further induce complicated chemical reactions with the substances dissolved in the water.

The idea is to take advantage of the technique of plasma discharge to kill *M. aeruginosa* while also remove microcystins simultaneously. Utilizing the self-made plasma discharge setup (*Environ Sci & Technol*, 2011, 45: 7841—7847), and employing fluorescence excitation-emission matrix and flow cytometry, they investigated the oxidation damage of *M. aeruginosa* cells, and found that plasma discharge at the gas-interface of the irradiated water can indeed inactivate the algal cells efficiently and in the meantime degrade the microcystins released by the damaged cells. The mechanism was confirmed that hydroxyl radicals generated in plasma discharge attack the membranes of algal cells, and then hydrogen peroxide gradually enter the membrane-disrupted cells and cause more severe damage. The method is also concerned for practical usage, as it has also been tested on real water such as the water retrieved from *ChaoHu* Lake (Anhui, China), where severe cyanobacterial blooms had occurred before.



**Figure** Morphological changes of *M. aeruginosa* caused by discharge plasma oxidation (lower panel), with the upper panel for untreated cells as comparison (left: cells under fluorescence-microscopy; middle: cells observed by scanning electron microscopy; right: fluorescence excitation-emission matrix from the cells).