13:15-, 5-September-2018
G201, KPSI, Kyoto, JAPAN
The 44th KPSI Seminar, KPSI-QST

Optical property of a single microdroplet levitated by an electrodynamic ion trap

Dr. Kenji Sakota
Department of Chemistry, Osaka City University, Japan.

A quadrupole ion trap (an electrodynamic ion trap) was originally invented by Wolfgang Paul in the late 50's to capture and storage charged particles. The electrodynamic ion trap uses oscillating electric fields to capture the charged particles because the simple static electric field cannot trap the charged particles in all three directions, which is known as Earnshaw's theorem. Since the invention of the ion trap, it plays crucial roles in the various areas of physics and chemistry, such as atomic and molecular physics, quantum photonics, atmospheric chemistry and mass spectrometry.

A single charged microdroplet can also be levitated (trapped) stably in the air by using the electrodynamic ion trap. The single levitated microdroplet has fascinating optical properties. For example, it naturally forms an almost perfect sphere due to its surface tension, which leads to an ultimate capability of confining light in the droplet (very high Q-factor). In addition, spontaneous emission rate in the microdroplet having a diameter of less than ~6 micron is drastically enhanced, which is knowns as Purcell effect. On the other hand, the single microdroplet can also be regarded as a tiny "chemical flask". This is a superior platform of studying the impact of the confined (limited) space on chemical reactions, which may be an ideal model system of biological cells. If we study the microdroplet as a tiny flask with its own unique optical properties, a new research field may open up. In this presentation, I will talk about our on-going research project on laser microscopy of a single levitated microdroplet.

CV; Associate Prof. Dr. Kenji Sakota
1) Personal Information;
-Date of Birth: 1976
-Nationality: Japan
2) Work Experience;
- 2002-2016 Assistant Professor, Kyushu University
- 2016-Present Associate Professor, Osaka City University
3) Education;
- 2001, Kyushu University, Master of Science
- 2005, Kyushu University, Doctor of Science