Ph.D. defense

Institut de Chimie Séparative de Marcoule / CEA Marcoule
(UMR 5257, CEA, CNRS, Université Montpellier, ENSCM)

TEMIM OUERHANI

will present his Ph.D. dissertation

Effect of nitrogen and ammonia on sonoluminescence spectra and sonochemical activity

The defense will take place on **Tuesday, December 6, 2016** at **2.30 pm**

in the ICSM Auditorium

This thesis presents the studies on multibubble sonoluminescence (MBSL) performed at ICSM to complete previous results that have shown the formation of a non-equilibrium plasma in the multibubble cavitation in water. Sonoluminescence and sonochemical reactivity of water under continuous flow of noble gas and N_2 mixtures and of aqueous ammonia solutions under continuous flow of noble gas are studied by several experimental techniques. In addition to OH ($A^2\Sigma^+–X^2\Pi_i$) band and continuum emission usually observed in the SL spectra of water in the presence of noble gases, the sonoluminescence of NH ($A^3\Pi$) radicals was observed for the first time. Spectroscopy of sonoluminescence, the follow up of the sonochemical products and the spectral fits of NH ($A^3\Pi–X^3\Sigma^-$) and OH ($A^2\Sigma^+–X^2\Pi_i$) systems using Specair software indicate more drastic conditions at high US frequency. On the other hand, NH* and OH* radicals generated inside the cavitation bubbles are far from equilibrium ($T_v > T_r$) whatever the experimental conditions and the vibrational temperatures at high frequency ultrasound are much higher compared to 20 kHz ultrasound which leads to strong deviation from the equilibrium (non-Boltzmann behavior). In parallel, the evolution of the bubble size is measured by a pulsed ultrasound technique, in the framework of a collaboration between ICSM / LSFC and the University of Melbourne in Australia. The problem of the coalescence of bubbles under continuous flow of gas was identified, which greatly complicates the interpretation of results of bubble size. Another interesting observation is that the presence of nitrogen in argon leads to a strong reduction in bubble size.