The collaboration research for the Dual Graduate School between VNU and JAIST

[Title of collaboration research]: Nonlinear Optical Investigation of Surface Nano-Structured Metals

[The members of collaboration research]: Goro Mizutani, and Haruyuki Sano

[Reference home-page address]: http://www.jaist.ac.jp/ms/labs/mizutani/topic2/index.html

[Other references]: T. Iwai and G. Mizutani, Phys. Rev. B72, 233406 (2005)

[Contents]

It has been known that the surfaces of some noble metals with *d*-electrons such as platinum and gold reconstruct in order to reduce their surface energy. The detailed mechanism of this surface reconstruction has not yet been clarified and has been the topic of many research programs. It is strongly expected that an advanced study of the electronic spectra of reconstructed surfaces will clarify the interaction between the surface lattice and *d*-electronic states and the mechanism of surface reconstruction. We have been carrying out optical second harmonic (SH) spectroscopy on Au films and a Au(100) single crystal surface in order to study the *d*-electronic states of these noble metal surfaces. Optical second harmonic generation (SHG) should offer information on surface electronic states, since it is allowed only at surfaces for centrosymmetric media. In this project in order to clarify the effect of the surface atomic arrangement upon the electronic structure, we will carry out a SH spectroscopy of various noble metal reconstructed surfaces. We will also investigate the electronic spectra of stepped noble metal surfaces because the atomic steps on surfaces have been known to play an important role in the catalytic activities and the crystal growth.

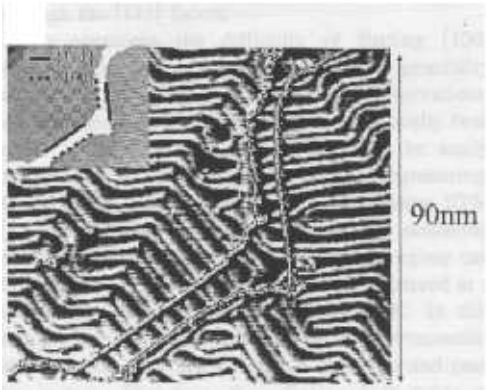

Fig. 1 STM image of Au(111) $\sqrt{3}$ X23

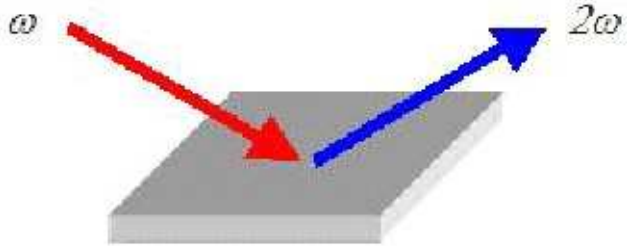

Fig. 2 Optical Second Harmonic Generation