Nuclear Motion Effects as Observed in the Resonant Auger Decay to the $X^2\Pi$ Electronic Ground State of N_2O^+

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High-resolution Auger spectroscopy applied under resonant Auger Raman (**RAR**) conditions is shown to be a powerful tool for characterizing complex potential energy surfaces in core-excited systems. Using the example of $N_t1s^{-1} \rightarrow \pi^*$ resonant Auger transition in nitrous oxide we emphasize the interplay between the nuclear motion and the electronic decay. We show how the choice of the excitation energy allows selection of core-excited species of different geometries [1,2]. The nuclear dynamics of these species are mapped by measuring the resonant Auger decay spectra. In addition to the changes in vibrational structure observed for the resonant Auger decay spectra, a strong influence of the nuclear motion on the electronic decay is revealed inducing the so-called "dynamical Auger emission". The experiments have been carried-out at the undulator beamline I411 at the Swedish synchrotron radiation facility Max-Lab in Lund. The experimental results are supported by *ab-initio* quantum chemical calculations restricted to a linear geometry of the core excited state (Figure 1).

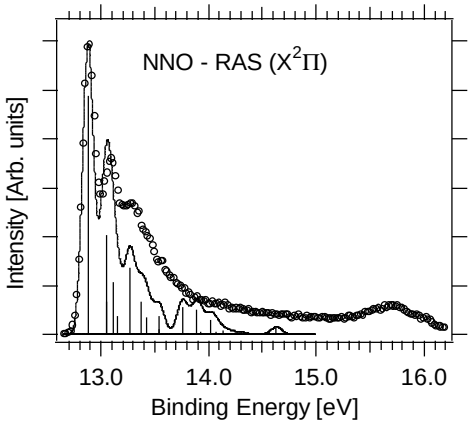

Figure 1: Comparison between *ab-initio* calculations (bars and continuous

line) and the experimental resonant Auger decay spectrum (empty circles) of the $X^2\Pi$ electronic state of N_2O measured on the top of the π^* resonance: $h\nu$ =401.3 eV.

References

[1] J. Adachi, N. Kosugi, E. Shigemasa and A. Yagishita, J. Chem. Phys. **102**, 7369 (1995).

[2] J. Adachi, N. Kosugi, E. Shigemasa and A. Yagishita, J. Chem. Phys. **107**, 4919 (1997).