Cathode Luminescence Spectroscopy of Gold Nanoparticle Catalyst in CO and O\textsubscript{2} Environments TAKAYUKI TANAKA, NAOKI YAMAMOTO, KUNIO TAKAYANAGI, Tokyo Institute of Technology; CREST, JST — Gold nanoparticle catalysts for low-temperature CO oxidation (2CO+O\textsubscript{2} \rightarrow 2CO\textsubscript{2}) [1] are especially attractive for applications in air purification. It is proposed that the resonance state of O\textsubscript{2} (O\textsubscript{2} \textsuperscript{−}) activates oxidation of CO and hydrocarbon in and gold nanoparticle on TiO\textsubscript{2} (Au/TiO\textsubscript{2}) [1, 2] and TiO\textsubscript{2} photocatalyst [3]. The TiO\textsubscript{2} is prepared by cleavage and annealing of rutile single crystal. Gold nanoparticles were deposited at vacuum. The Au/TiO\textsubscript{2} catalyst was observed by scanning transmission electron microscopy (STEM). Cathode luminescence spectra were acquired, when the electron probe were scanned in Au/TiO\textsubscript{2}. A CL peak is detected in spectra of vacuum. The peak energy depended on specimen and its location, e.g. 3.10 and 3.15 eV. The energies were close to band gap energy (3.0 eV). The CL peak of vacuum is attributed to electron-hole recombination of TiO\textsubscript{2}. The peak energy shifts because of interference effects. Cathode luminescence spectra change by O\textsubscript{2} exposure of 3x10\textsuperscript{−4} Pa. The differential spectra from vacuum to O\textsubscript{2} show new peaks, which have larger energies than band gap energy, 3.1 to 3.6 eV. The new peaks by O\textsubscript{2} exposure are the resonance state of O\textsubscript{2} adsorption. We will report the results of CL experiments of O\textsubscript{2}, CO exposure and co-exposure of CO and O\textsubscript{2} and propose mechanism of CO oxidation in Au/TiO\textsubscript{2}. [1] M. Haruta, et al., J. Catal. 144 (1999) 175. [2] T. Tanaka, et al., Surf. Sci. 604 (2010) L75. [3] H. Irie et al, J. Phys. Chem. C 113, 10761 (2009).