

K-edge XAFS of rare earth elements in oxides, carbides and nitrides

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K-edge x-ray absorption spectra of rare earth elements (Ce, Pr, Nd, Gd and Tb) in oxides, carbides and nitrides were measured at room temperature in a transmission mode at the beam line BL01B1 (monochromator : Si(311), without collecting mirror system). These rare earth carbides were synthesized by carbothermic reduction of oxides at 1400°C, and nitrides were prepared by the reaction of these carbides with ammonia steam at 1200°C. These compounds were shaped into pellets with proper thickness for XAFS measurement. The pellets of carbides and nitrides were sealed up in polymer holders with paraffin to avoid oxidation during transportation and measurements because these compounds are very sensitive to oxygen and moisture. All the process for the preparation of XAFS specimens were carried out in a glove box filled with argon gas.

Figure 1 shows the derivative spectra, $d\mu/dE$, vs. E , of CeO_2 , CeC_2 and CeN , in which absorption coefficient, μ , was normalized to the jump height at each edge. The chemical shifts among three compounds are clearly observed. We have checked that these shifts are not due to energy drift of x-ray by measuring edge energy of CeO_2 at intervals throughout our machine time.

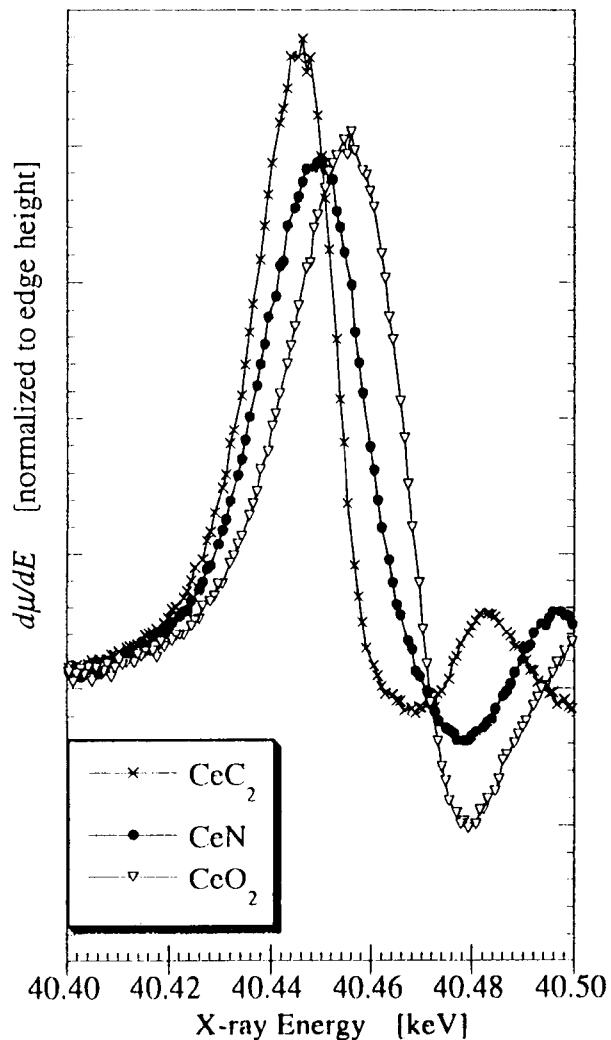


Fig. 1 Relationship between the derivative spectra, $d\mu/dE$, of CeO_2 , CeC_2 and CeN and x-ray energy, E