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Probing Local Structures in ZrO_2 Nanocrystals Using EXAFS[1]
Y.L. SOO, P.J. CHEN, S.H. HUANG, T.J. SHIU, T.Y. TSAI, Y.H. CHOW, Y.C. LIN, S.C. WENG, S.L. CHANG, National Tsing Hua University, J.F. LEE, NSRRC, Taiwan, C.L. CHEUNG, R.F. SABIRIANOV, F. NAMAVAR, W.N. MEI, University of Nebraska — Extended x-ray absorption fine structure (EXAFS) has been employed to investigate the local structures surrounding Zr in cubic zirconia thin films prepared by an ion beam assisted deposition technique. These materials have demonstrated promising mechanical properties such as improved hardness and lubricant wettability compared to yttria-stabilized zirconia. To verify the cubic structure of zirconia in films prepared under different growth conditions and to fully understand the mechanism leading to their unique physical properties, the structural information is a required prerequisite. Since zirconia is in the form of nanosized crystallets, conventional x-ray diffraction method is not useful for this purpose. Our x-ray results reveal cubic-like structure with O vacancies around Zr in several nanocrystal samples. Powders of cubic zirconia prepared using chemical methods were also measured for comparison.

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