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**Shape transitions in neutron-rich Ru isotopes: spectroscopy of $^{109,110,111,112}$Ru** C.Y. WU, LLNL, H. HUA, D. CLINE, A.B. HAYES, R. TENG, D. RILEY, U. of Rochester, R.M. CLARK, P. FALLON, A. GOERGEN, A.O. MACCHIAVELLI, K. VETTER, LBNL — The spectroscopy of neutron-rich $^{109,110,111,112}$Ru nuclei was studied by measuring the prompt $\gamma$ rays originated from fission fragments, produced by the $^{238}$U($\alpha$,f) fusion-fission reaction, in coincidence with the detection of both fragments. For $^{109,111}$Ru, both the negative-parity ($h_{11/2}$ orbitals) and positive-parity ($g_{7/2}$ and/or $d_{5/2}$ orbitals) bands were extended to substantial higher spin and excitation energy than known previously. The ground-state and $\gamma$-vibrational bands of $^{110,112}$Ru also were extended to higher spin. This extension allowed observation of the second band crossing at a rotational frequency of $\approx$450 keV in $^{112}$Ru, which is $\approx$50 keV above the first band crossing. At a similar rotational frequency, the first band crossing for the $h_{11/2}$ band in $^{111}$Ru was observed, which is absent in $^{109}$Ru. These band crossings most likely are caused by the alignment of the $g_{9/2}$ proton pair. This early onset of the band crossing for the aligned $\pi g_{9/2}$ orbitals may be evidence of a triaxial shape transition from prolate to oblate occurring in $^{111}$Ru. The data, together with the comparison of calculations of the cranked shell model, will be presented. Work supported in part by DOE under contracts no. W-7405-ENG-48 (UC-LLNL) and DE-AC03-76SF00098 (UC-LBNL). Work at University of Rochester supported by NSF and AFOSR.

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