

Abstract Submitted  
for the APR08 Meeting of  
The American Physical Society

**SPS Outstanding Student Award for Undergraduate Research**

**Talk: Lifetime Measurements and Deformation in  $^{79}\text{Sr}$**  YUN KYOUNG RYU, ROBERT KAYE, S.R. ARORA, Ohio Wesleyan University, S.L. TABOR, Florida State University, J. DORING, Gesellschaft für Schwerionenforschung, Y. SUN, University of Notre Dame, T.D. BALDWIN, D.B. CAMPBELL, C. CHANDLER, M.W. COOPER, S.M. GERBICK, M. WIEDEKING, C.R. HOFFMAN, J. PAVAN, Florida State University, O. GRUBOR-UROSEVIC, Purdue University Calumet, L.A. RILEY, Earlham College — High-spin states in  $^{79}\text{Sr}$  were produced following the  $^{54}\text{Fe}(^{28}\text{Si}, 2pn)$  fusion-evaporation reaction using a beam kinetic energy of 90 MeV at the Florida State University (FSU) Tandem-Linac particle accelerator facility, and the resulting de-exciting  $\gamma$  rays were detected with the FSU array of 10 Compton-suppressed high-purity Ge detectors comprised of three Clover detectors and seven single-crystal detectors. The synthesized nuclei were stopped completely in the target, resulting in Doppler-shifted  $\gamma$ -ray line shapes that could be analyzed using the Doppler-shift attenuation method. The experimental line shapes were acquired at detection angles of  $35^\circ$  and  $145^\circ$ , and the resulting Doppler-shifted peaks were analyzed to extract the lifetime of their parent states. In all, 23 lifetimes were measured in three separate band structures using this method, and then used to infer transition quadrupole moments ( $Q_t$ ) and quadrupole deformations ( $\beta_2$ ) using the rotational model. The resulting  $Q_t$  values indicated a high degree of collectivity and deformation in all three observed sequences of excited states (bands) with only a modest decline in collectivity with increasing angular momentum. The results show good qualitative agreement with the predictions of both cranked Woods-Saxon (CWS) and projected shell model (PSM) calculations. In addition, the pattern of excited energy states and their de-exciting gamma-ray transitions (level scheme) was re-examined and compared to the most recent study of  $^{79}\text{Sr}$  using  $\gamma - \gamma$  coincidence measurements, intensity measurements, and directional correlation of oriented nuclei (DCO) ratios in addition to the lifetime measurements. Overall, the level scheme was verified, with the exception of the re-arrangement of one transition. The band based on the intrinsic  $d_{5/2}$  single-particle orbital from the shell model, was found to have the largest average deformation ( $\beta_{2,\text{ave}} = 0.41$ ) among the three observed bands, in agreement with the CWS and PSM theoretical predictions

Date submitted: 25 Jan 2008

Yun, Kyoung Ryu  
Ohio Wesleyan University

Electronic form version 1.4