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# Fermi Surface Tomography of Palladium via Momentum Microscopy

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The Fermi surfaces, which describe all thermodynamical and transport quantities of solids, of transition metals are often failed to be modeled by one-electron mean-field theory due to strong correlations among the valence electrons. In addition, relativistic spin-orbit coupling pronounced in heavier elements lifts the degeneracy of the energy bands and further modifies the Fermi surface[1]. Palladium, a 4d metal attributed to both significant spin-orbit coupling and electron correlations, is ideal for a systematic and fundamental study on the two fundamental physical phenomena and their interplay in electronic structure. In this presentation, we will explore the experimentally determined electronic structure of palladium in four dimensional energy-momentum space ($E_{Binding}$,$k_x$,$k_y$,$k_z$) obtained via momentum microscopy[2]. Assuming a free-electron dispersion of the final-state as depicted in Figure 1a., the complete 3D-Fermi surface of palladium and corresponding isoenergy surfaces at higher binding energies were tomographically mapped with an energy- and polarization-variable light source. In order to fully capture the orbital angular momentum of states across the Fermi surface, the tomography was measured in both p- and s- polarization as shown in Figure 1b. and 1c. Spin-orbit coupling and electron correlations in palladium will be presented in the context of energy-momentum relations across the Fermi surface and isoenergy surfaces in comparison with state-of-the-art fully relativistic Korringa-Kohn-Rostoker (KKR) calculations performed using the one-step model of photoemission[3].

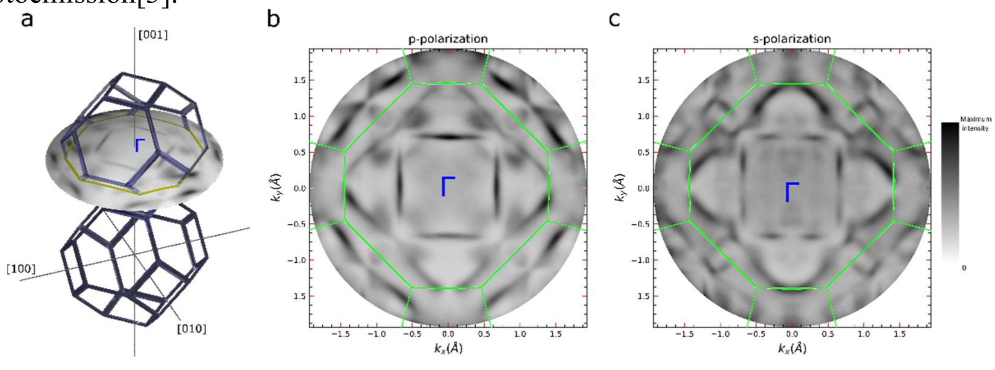


**Figure 1. a.** Sphere of constant final-state momentum cutting through the Γ high symmetry point of palladium at ($k_x$,$k_y$) = (0,0), under the assumption of a free-electron dispersion of the final-state. **b.** and **c.** show the momentum images at the Fermi energy obtained at photon energy of 155eV using p- and s-polarization, respectively. The measured momentum images correspond to the spherical section through the Brillouin zone outlined in (a).

**References**

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