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Low Energy Positron Scattering, Transport, and Applications

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Relatively intense, high energy-resolution beams of low-energy positrons are now available through the use of buffer-gas (Surko) traps. These have led to measurements of interaction cross sections for a broad range of atoms and molecules, including molecules of biological interest. The increased energy resolution, and experimental techniques developed for scattering in strong magnetic fields has also enabled highly accurate measurements of discrete excitation processes such as electronic and vibrational excitation, positronium formation and ionization in a range of atomic and molecular species. This talk will review some of these measurements and discuss their application in new and sophisticated models of positron transport which aim, for example, to provide a better understanding of the atomic and molecular processes which occur when positrons are emitted in the body during a Positron Emission Tomography scan. This work is part of a broad collaboration between the ANU (James Sullivan, Joshua Machacek), Flinders University (Michael Brunger), James Cook University (Ronald White and co-workers) CSIC Madrid (Gustavo Garcia) and the Institute of Physics, Belgrade (Zoran Petrovic and colleagues).