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Modeling Positron Transport in Gaseous and Soft-condensed Systems with Kinetic Theory and Monte Carlo[1] G. BOYLE, W. TATTERSALL, R.E. ROBSON, RON WHITE, ARC Centre for Antimatter-Matter Studies, School of Engineering and Physical Sciences, James Cook University, Townsville, S. DUJKO, Z. LJ. PETROVIC, Institute of Physics, University of Belgrade, Zemun, Belgrade, Serbia, M.J. BRUNGER, ARC Centre for Antimatter-Matter Studies, School of Chemical and Physical Sciences, Flinders University, Adelaide, Australia, J.P. SULLIVAN, S.J. BUCKMAN, ARC Centre for Antimatter-Matter Studies, Research School of Physical Sciences, Australian National University, Canberra, Australia, G. GARCIA, Instituto de Fisica Fundamental, Consejo Superiorde Investigaciones Cientificas, Madrid, Spain — An accurate quantitative understanding of the behavior of positrons in gaseous and soft-condensed systems is important for many technological applications as well as to fundamental physics research. Optimizing Positron Emission Tomography (PET) technology and understanding the associated radiation damage requires knowledge of how positrons interact with matter prior to annihilation. Modeling techniques developed for electrons can also be employed to model positrons, and these techniques can also be extended to account for the structural properties of the medium. Two complementary approaches have been implemented in the present work: kinetic theory and Monte Carlo simulations. Kinetic theory is based on the multi-term Boltzmann equation, which has recently been modified to include the positron-specific interaction processes of annihilation and positronium formation. Simultaneously, a Monte Carlo simulation code has been developed that can likewise incorporate positron-specific processes.

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