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Positron transport, thermalization and annihilation in atomic noble gases and liquids and metal vapours gases[1]

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A transport theory that explicitly incorporates loss of flux due to annihilating collisions is developed and applied to low energy positron drift, diffusion and annihilation. The use of more complete momentum transfer and annihilation cross sections for helium and argon have resulted in improved descriptions of the time dependence of Zeff for positrons injected into these gaseous systems. Similarly, the variation of Zeff versus reduced electric field for experiments where the annihilation region is immersed in an electric field is in closer agreement with experimental data. In this work we highlight new results for positrons in xenon gas and compare with existing experimental results to highlight the need for careful interpretation of these experiments. We also highlight new results for positrons in various metal vapours including Zn, Be and Mg using new cross-section calculations and how the results compare with the electron counterpart. Extension to include dense gas and liquid phase effects are also considered.

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