

The Quenching of ortho-Positronium

Toshio Hyodo

*Department of Basic Science, Graduate School of Arts and Sciences,
University of Tokyo
3-8-1 Komaba, Meguro-ku, Tokyo 153-8902, Japan*

Ortho-Positronium (o-Ps), which self-annihilates into 3γ with a lifetime of 142ns, may be quenched through various interactions with other atoms or molecules. The long lifetime of o-Ps, compared with that of para-positronium (p-Ps), is attributed to the triplet spin state of the former. Thus o-Ps is quenched when the positron in the o-Ps somehow annihilates with an electron of the opposite spin into 2γ .

The quenching of o-Ps may be classified into several cases:

- (i) pick-off quenching [1]
- (ii) spin conversion quenching through electron exchange with:
 - a molecule with non-singlet spins such as O₂ [2]
 - a radical on a solid surface [3]
 - a conduction electron on metal surface
- (iii) spin conversion quenching through spin-orbit interaction with a heavy atom [4, 5]
- (iv) chemical quenching [6]

In this report these processes are overviewed.

References

- [1] M. Charlton, *Rep. Prog. Phys.* **48**, 737 (1985).
- [2] N. Shinohara, N. Suzuki, T. Chang and T. Hyodo, *Phys. Rev. A* **64** 042702 (2001).
- [3] H. Saito and T. Hyodo, *Phys. Rev. B* **60** 11070 (1999).
- [4] J. Mitroy and S. A. Novikov, *Phys. Rev. Lett.*, **90** 183202 (2003).
- [5] H. Saito and T. Hyodo, *Phys. Rev. Lett.*, **90** 183202 (2003).
- [6] S. Y. Chuang and S. J. Tao, *Phys. Rev. A* **9** 989 (1974).