O48 | Advanced positron techniques for practical applications: history, current, and future developments

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Positron annihilation spectroscopy (PAS) is often performed using radioactive sources for bulk measurements or positron beams for depth resolved measurements. Both have many advantages and great capabilities for a variety of applications. In the recent history, we have shown that PAS can be also carried out directly using high energy photons without creating positron source or positron beams [1,2]. This approach brings unique capabilities for some specific applications and promotes the use of PAS in new areas of materials science and probably in industrial applications. Some of the important applications include developing new nondestructive highly penetrating sensitive probe for structural and engineering materials. I will present some data to support this claim. It can also greatly advance the applications of PAS in semiconductors, electronic and photonic materials as well as in polymers, ceramics and liquids. The recently developed Gamma induced positron spectroscopy (GIPS) [3,4] in HZDR in Dresden provides a state of the facility for many of these applications [5].

It In this talk, I will present the history and development of the technique, the current and future facilities. A facility for this technique can be easily incorporated in a wide range of accelerators and nuclear reactors at modest cost. I will show examples for that including the use of table top electron accelerators and Van De Graff accelerators and present a concept and design for its incorporation in a small research nuclear reactor.

When incorporated with pulsed accelerators, this technique may trigger novel studies of transient states in matter and explore several solid-state processes that take place on short time scale [6].

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