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Analysis of Precipitation and Lattice Defects in Aluminum Alloys Using Positron Annihilation Spectroscopy

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Light metal alloys are a vital part in industrial applications such as aviation, electric vehicle construction and space flight. Despite the advancements in composite materials, aluminum alloys are still the only choice for numerous technical components. Pure aluminum exhibits generally poor mechanical properties. By alloying aluminum with other metals such as copper, lithium or manganese, its mechanical properties can be vastly improved. For many of these light metal alloys, precipitation hardening causes a considerable gain in mechanical strength.

Positron annihilation techniques are usually applied to investigate lattice defects with highest sensitivity. In particular, Coincident Doppler Broadening Spectroscopy (CDBS) can be used to study the chemical surrounding of vacancy-like defects and precipitates in aluminum alloys. With CDBS, we analyzed various alloys after undergoing a wide variety of solution annealing and tempering steps in order to give a more detailed insight into precipitation behavior.

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