Negative muon spin rotation study of acceptor centers in SiC

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Silicon carbide (SiC) is a promising semiconducting material for the next generation of microelectronic devices capable to operate under extreme conditions, such as elevated temperatures and high levels of ionizing radiation. For p-type doping of SiC aluminium and boron atoms are most commonly used.

The goal of our study is to obtain information on the centers formed by an Al atom at the Si - cite (Al_{Si} substitutional impurity) and by a B atoms at the C - cite (B_C). The B_C center, for example, has not been detected by any experimental method. The Al_{Si} and B_C substitutional impurities in SiC are modelled by $_\mu$Al and $_\mu$B muonic atoms formed via negative muon capture by Si or C atoms of the host material. Interactions of the $_\mu$Al and $_\mu$B acceptors with the medium (relaxation and ionization processes) are studied via observation of the muon polarization. To distinguish between the muons captured by Si and C atoms the energy of characteristic X- rays emitted during the muon transition to the 1s atomic state is measured (an X - ray triggered μSR [1,2]).

The first experimental results with an n-type 4H-SiC are reported.

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