Low-Energy-Muon [LEM] Study of Zn-Phthalocyanine and ZnO Thin Films

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Implantation of low energy muons in Zn Phthalocyanine (ZnPc) thin-films leads to the formation of muonated radical states. The fast decay of the μSR signal at low fields (Fig.1) is a clear indication for muonium formation. The formation probability of these paramagnetic states is independent of the implantation depth and amounts, as in the bulk, to approximately 100 % of all muons. In these molecular crystals the formation of muonium is a very local effect and is fairly independent of crystalline structure and defects in the sample.

In contrast to that, in evaporated ZnO films the paramagnetic signal known from bulk experiments is not observed, also not in the deeper implantations. We suggest that in this case the lack of electrons is the cause that muonium is not formed. In these strongly distorted films, the electrons are captured at defects and are not available for muonium formation.

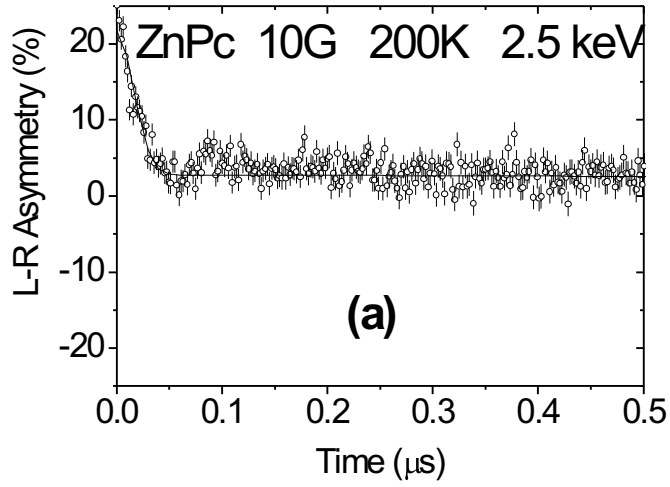

Fig. 1: (a) Transverse field MuSR spectrum of the ZnPc thin film at 200 K at 10 G, with a muon implantation energy of 2.5 keV.