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Depth profiling of LE-μSR parameters with musrfit

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The study of thin-film and multi-layered structures with nanometer resolution is possible with low energy μSR (LE-μSR). The average stopping depth of the positive muons with implanted energies between 1 and 25 keV extends over a few nanometers and depends on the density of the probed material.
Modeling of the measured μSR parameters such as diamagnetic asymmetry and relaxation rate as a function of sample depth can be obtained from a series of experimental implantation energy measurements and its correlation with the simulated stopping profiles. The fitting approach assumes a sharp transition between regions with distinct properties, such as layers with different materials, defects, and intermixing near the interface, or, depletion regions where the charge carriers concentrations may change. The fitting method, previously developed in matlab, is being implemented in musrfit, a free μSR data analysis framework written in C++. The main goal is to make this fitting method widely available for energy dependent measurements and increase the modeling possibilities within musrfit.
We will present the added functionality, its implementation, and different examples where the systems measured with LE-μSR could be better understood by quantifying the width of physically relevant regions.

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