MAT Science Week
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Applying an Evolutionary Algorithm for Automated Ion Beam Analysis Data Evaluation

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To extract chemical compositions and layer thicknesses of layered samples from Ion Beam Analysis (IBA) spectra experimentalists typically have to simulate a theoretical spectrum for an initial target configuration and compare the outcome to the measured data followed by the successive re-adjustment of the target model until simulation result and experimental spectrum fit each other. For multi-element layered samples this procedure can get rather time consuming. Although modern IBA spectrum simulation software like SimNRA[1] or WINDF[2] have become quite powerful tools, the analysis of IBA spectra consumes still a significant fraction of an IBA scientist's working time.

In this contribution, we present a new approach for automated IBA spectra fitting by applying an evolutionary algorithm. We show that this approach is well suited and robust for complete and fast IBA spectrum fitting with minimum input of boundary conditions. Furthermore, the benefits of this algorithm and the particular differences to the simulated annealing approach are pointed out.

Based on this algorithm a platform independent software package has been developed that comprises a clean and easy-to-use graphical user interface. We will introduce this software in a basic overview.

[1] M. Mayer, AIP Conf. Proc. (AIP), 1999, 541-544.

[2] N. P. Barradas, C. Jeynes, R. P. Webb, Appl. Phys. Lett. 71(2), 1997, 291.

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