Transient analysis of growth/decay in materials utilizing a digital exponential peeling method

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Abstract

An algorithm is proposed to implement digital peeling to determine dominant time constants of an exponential transient process. The method is simpler to implement and reduces computational time to a large extent in comparison to other techniques widely used. Apart from a synthetic test function, the algorithm has been implemented on reported experimental transient decay curves of Cs_2HfCl_6 (CHC) single crystal scintillation to verify its efficacy. Finally, drain current detrapping transients of unpassivated AlGaN/GaN high electron mobility transistors (HEMTs) are analysed to determine the trap energy levels and concentrations. The validation of this digital peeling technique is also carried out by comparing with conventional method of time constant extraction from HEMT current transients. The extracted exponentials from the transient data efficiently fits well with the experimental data and can be extensively used for transient analysis. The digital peeling technique has wide applicability and can be used to analyze all exponential processes which occur in all domains of science.

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