Multilayer Electron Beam Resist Systems for the Application in High Frequency Electronics Fabrication

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Abstract. This paper focuses on the experimental investigation and simulation of electron lithography (EBL) for the case of multilayer resist systems. Important parameters of the EBL process, such as dissolution rate, resolution, absorbed energy, and resist profile in the investigated bilayer and trilayer resist systems are studied, and discussed. Different combinations of resist layers with positive electron resist are proposed to study the effect of lithographic process parameters on the resist profile. The selected resist materials are polymethyl methacrylate - PMMA 950k A2 and A6 (Kayaku, formerly Microchem), copolymer (methyl methacrylate-co-methacrylic acid) - MMA (8.5) MAA EL11 (Kayaku, formerly Microchem), SML 300 (EM Resist), and AR-P 6200 (CSAR 62) series (Allresist). The results of this work are intended for the use of multilayer resist systems in the production of high-frequency electronics, where the production of a T-shaped gate is one of the most important key processes. This work was supported by the Bulgarian National Science Fund within the SAS-BAS joint research project “Preparation of nanometre patterns in 2D materials using electron beam lithography”, and by the Slovak Academy of Sciences within the joint research project SAS-BAS-2022-05.