

WATER-SOLUBLE RESIST FOR DEEP-UV (193 NM) PHOTOLITHOGRAPHY BASED ON A CHITOSAN BIO-POLYMER

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The development of sustainable technological processes is a major concern of all industrial sectors, including microelectronics. Industrial resists and solvents used in their development are usually oil-derived products that are also known to be harmful and toxic [1]. Chitosan is derived from chitin, an abundant biosourced polymer, which is non-toxic, water-soluble and biodegradable. Chitosan resist can form thin films with controlled properties and can be prepared free of cations which is crucial for the transistors production. It was already shown that chitosan can be used as a resist for UV [2,3] and E-beam lithography [2,3]. For the UV lithography, the addition of photosensitive components was necessary.

In this work, the interaction between chitosan and Deep-UV was studied using different characterization techniques such as: FTIR-ATR, XPS, ToF-SIMS, SEC and EPR. Based on the results, we proposed a mechanism of photoinduced modification of bio-sourced photoresist. Micrometric features were obtained at the laboratory using only deionized water as a developing agent [4]. The examples of photopatterning are presented in Fig 1. Chitosan was also proved to be compatible with a 200/300mm pilot line and can be transferred by plasma etching into silica [5]. Ways to improve the photosensitivity of the resist were also studied. The addition of photoacid generator (PAG) decreases almost two times the dose-to-clear.

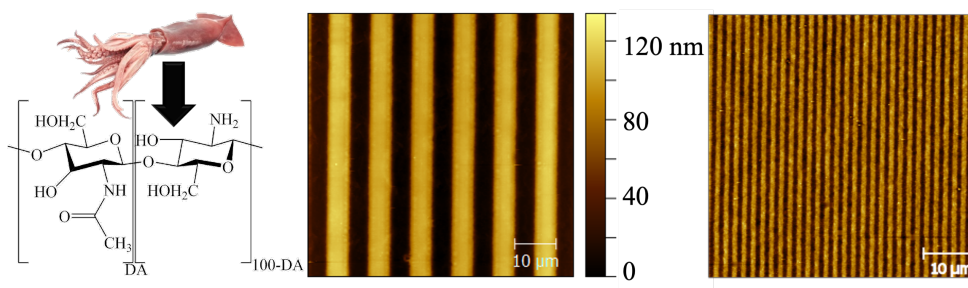


Figure 1. Molecular structure of chitosan and examples of patterns obtained by DUV photolithography.

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