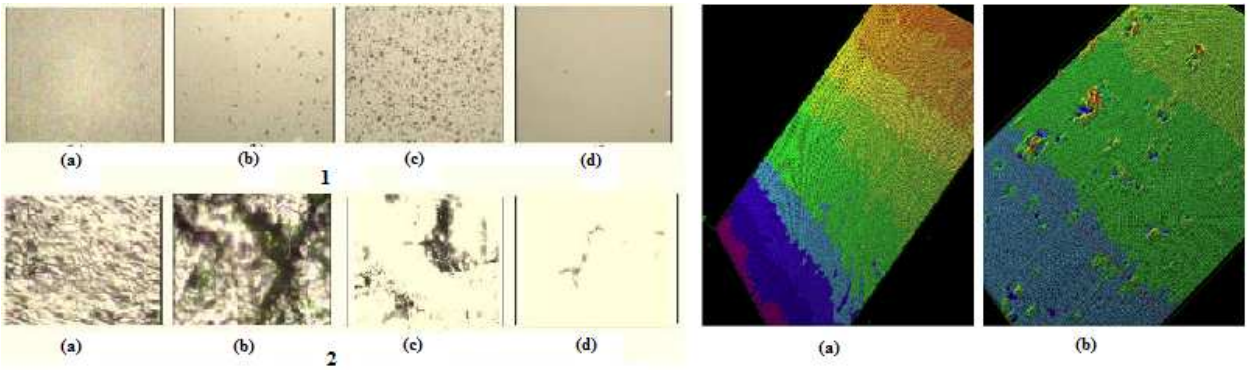
Task ID: 425.033
Task Title: Development of an All-Wet Benign Process Based on Catalyzed Hydrogen Peroxide (CHP) Chemical System for Stripping of Implanted State-of-the-Art Deep UV Resists
Deliverable Title: Report on the analysis of amorphous carbon and graphitic films used as model compounds

Abstract:
Disruption of crust (carbonized layer) that typically forms on photoresists exposed to high energy ion dose was investigated using amorphous carbon (in the form of ~ 900 Å film formed by RF decomposition of C_2H_2) and graphite foil (thickness ~ 0.5 mm) as model compounds. Morphological changes after CHP treatment were characterized using Leica DM4000B microscope operated using QCapture Pro 5.0 software and Leeds Confocal microscope respectively.

Technical Results:
CHP solutions (pH~2.8) containing 20% H_2O_2 and different Fe^{2+} levels (1mM, 5mM, 10mM) were used at ambient conditions and the results are shown in Figure 1A. Presence of 5mM Fe^{2+} ions created many pores in amorphous carbon films and graphite foil within an hour. Amorphous carbon film treated with CHP system containing 5mM Fe^{2+} ions and 20% H_2O_2 at 80^0C for 15 minutes created pores of size ~ 90 nm measured by confocal microscope as shown in Figure 1B.



1A 1B

Figure 1A: Optical microscopic images (magnification 1000x) of (1) amorphous carbon films and (2) graphite foil after CHP treatment using 20% H_2O_2 a) Control (without CHP treatment) b) 1mM Fe^{2+} c) 5mM Fe^{2+} d) 10mM Fe^{2+}; Figure 1B: Confocal microscopic images (magnification 17Kx) of a-C film a) Blanket a-C film b) a-C treated with 5mM Fe^{2+}, 20% H_2O_2 at 80^0C for 15minutes

Conclusion:
The results show that CHP system has the capability to attack carbonaceous materials by creating pores of depth equal to film thickness.