Abstract Submitted
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Development Characteristics of PMMA in alternative alcohol:water mixtures[1] LEONIDAS E. OCOLA, Argonne National Laboratory — The most widely used resist in electron beam lithography is polymethylmethacrylate (PMMA). The standard developers used are solution mixtures of isopropanol (IPA) and methyl isobutyl ketone (MIBK) in a ratio of 3:1 and mixtures of IPA and water (H2O) in a ratio of 7:3. The Globally Harmonized System (GHS) classification entry for IPA includes: Specific target organ toxicity - single exposure (Category 3). MIBK is much more hazardous than IPA. The only GHS classification entry for Ethanol is: Flammable liquids (Category 2), i.e. more environmentally safe. Using Ethanol/H2O as a developer will therefore enable lower hazardous waste disposal costs to cleanrooms. We find Ethanol/H2O at 85% volume (2:1 molar) exhibits excellent lithography results as good as with IPA/H2O, and better contrast and sensitivity than IPA/H2O and MIBK/IPA developers. Lithographic data shows trends similar to published cosolvency data, but differ too much to be explained by it. In addition, unusual development at 50% volume concentrations for both IPA and Ethanol in H2O show dramatic pothole formation instead of uniform thickness loss found in standard contrast curve exposures. We believe local pockets of concentrated alcohol water molar mixtures are responsible for such behavior.

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Leonidas Ocola
Argonne National Laboratory

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