Low Diffusion EUV Resists using Bound PAG Technology

James W. Thackeray, James F. Cameron, Michael Wagner, Vipul Jain, Owendi Ongayi, Suzanne Coley, Paul LaBeaume

[1]*Dow Electronic Materials, 455 Forest St, Marlborough, MA 01752 USA*

The development of low acid diffusion chemically amplified resists has enabled the resolution of 17nm hp features at doses less than 15mj using EUV technology [figure 1]. However, linewidth roughness (LWR) and pattern collapse remain difficult challenges for EUV resists. This paper will describe the evolution of polymer-bound PAG technology as applied to high resolution applications. This paper will focus on key parameters to optimize LWR such as PAG density and EUV resist absorption. The authors will also report on key parameters such as resist film quantum yield and its key role in LWR improvement. Another very important factor to improve LWR and pattern collapse is optimization of the underlying substrate. This paper will discuss the performance of our resists on primed Si, organic underlayers, and Si-containing underlayers. Figure 2 illustrates dramatic differences in substrate selection on resist performance. For Si underlayers, we see good overexposure performance for 28nm hp patterns with no line collapse down to 20nm CDs. For organic underlayers, we see collapse at the same condition. For Si, we see dramatic resist mottling and poor LWR.

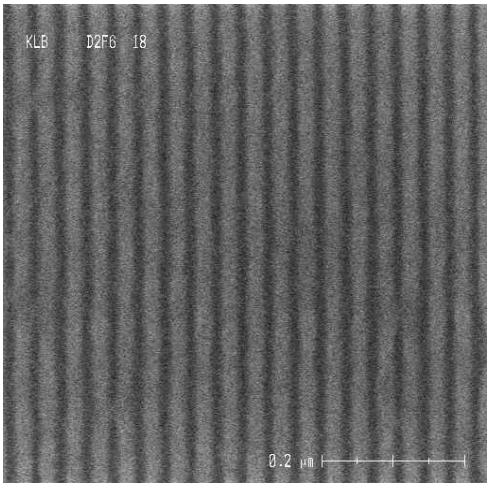
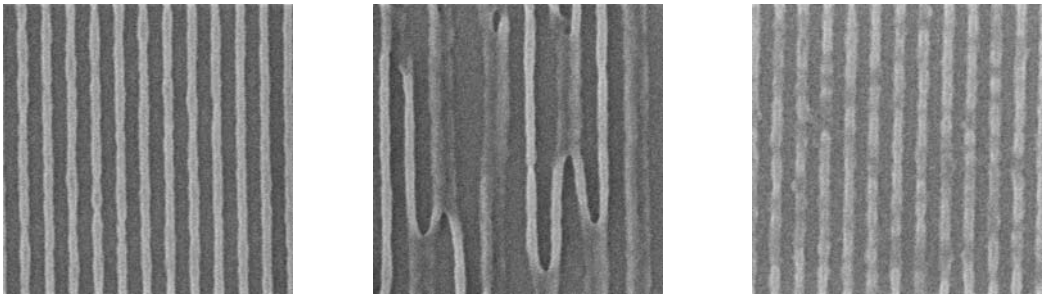


Figure 1. Low Diffusion CA Resist resolves 17nm hp using EUV lithography

.



a. Si-UL b. organic UL c. Si

Figure 2. Pattern dependence on substrate.