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Photomasks for EUV Lithography

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The equipment and process development model for extreme ultraviolet (EUV) masks spans international consortia, closely held multiparty alliances, individual user efforts, materials/equipment programs and ad hoc collaborations. Mask integration efforts are also spread widely from captive mask programs driving toward early and specific EUV use cases to more general-purpose efforts typical of broad application foundry or merchant business models. Even specifications for EUV masks remain a dynamically moving target as the reflective and film properties of the mask coupled with incoming illumination obliquity represent a dramatic departure from previous mask technology. Finally, due to the highly sensitive nature of mask technology as the entry point of a chip design into the fab, many teams are understandably reluctant to publish works due to competitive concerns. For these reasons, it seems particularly valuable to aggregate and highlight important work under way to address key issues in EUV mask development. We are therefore grateful to the expert authors who have provided contributions to this special edition in the following critical areas:

- Mask defects and inspection often viewed as the most challenging integration module for delivering production-worthy EUV masks;
- Mask blanks representing the critical starting point for high-yielding mask fabrication;

- Interplay between mask quality and mask printing, which has particular importance for the new emerging patterning system;
- Etching of the mask posing special challenges thanks to the unique substrate characteristics.

We hope you will be encouraged by the progress and understanding demonstrated in these works for critical parts of the mask infrastructure. Despite the unique challenge of delivering a new mask technology to the industry, it is clear substantial progress is being made toward the end goal. Of course, readers should draw their own conclusions, and, toward that, we urge EUV ecosystem participants to continue adding to the discussion by publishing new works that support a vigorous EUV mask co-learning and technology dialogue.

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Guest Editors