

Nanoimprint Lithography (NIL): Materials & Metrology Needs

1. What best describes the organization that you work for:
 - A. Industry, small company (< 25 employees)
 - B. Industry, large company (> 25 employees)
 - C. Academia
 - D. Government
 - E. Other _____

2. How long has your organization been actively working with NIL?
 - A. Less than 1 year
 - B. Less than 3 years
 - C. Less than 5 years
 - D. More than 5 years
 - F. We are not currently working with NIL

3. How would you classify your primary interest in the NIL technology?
 - A. Commercial applications fabricated by NIL
 - B. The development or commercialization of NIL equipment
 - C. The development or commercialization of imprint resists/materials
 - D. Fundamental research with NIL
 - E. Services to facilitate imprint technology (specify) _____

4. Which variations of NIL are of most interest to you (you can select more than one)?
 - A. Thermal wafer-scale NIL
 - B. UV wafer-scale NIL
 - C. Thermal step-and-repeat NIL
 - D. UV step-and-repeat NIL
 - E. Roll-to-roll / roll-to-plate NIL
 - F. Transfer printing
 - G. Other (specify) _____

5. How would you like to use the patterns fabricated by NIL?
 - A. As a mask for some form of etching (i.e., a subtractive process)
 - B. As a mask for some form of deposition (i.e., an additive process)
 - C. Directly as part of my end product
 - D. Other (specify) _____

6. When do you think NIL patterning will have an impact in the following sectors?
(do not answer for sectors that you are unfamiliar with)

	0-2 years	3-4 years	5-10 years	10+ years	NIL will never have an impact	I do not know
magnetic data storage media						
optical communications						
LED						
display technologies						
labs-on-a-chip						
fluidic type devices						
semiconductor – transistor/gate level						
semiconductors – back end interconnects						
Other...						

7. What is the range of feature sizes that you are most interested in patterning?
8. What is the range of aspect ratios (height-to-width) that you are most interested in patterning?
9. How many lithography layers do you anticipate to make with NIL in your device?
10. Is there a threshold value with respect to the cost per imprint layer before you would consider implementing NIL technology?
11. What kinds of measurements are needed to facilitate nanoimprint related technologies?
12. What is the most critical problem facing NIL technologies for the production of commercial products?
13. What is the biggest bottle neck in the future use of NIL in production?
14. What is the biggest problem with the commercially available imprint materials?

15. What is your requirement with respect to imprint overlay alignment?
16. What is the biggest advantage of NIL as an emerging lithographic patterning technique?
17. What is the greatest liability of NIL as an emerging lithographic patterning technique?
18. Do you have strong interests in patterning functional materials (not just resists) with NIL? If so, what kind of functional materials?

Please rate the following questions on a scale of 1 to 5

1 means *not critical*
5 means *extremely critical*

19. How important is it to improve the metrology tools used for template inspection in nanoimprint lithography processes?
20. How important is it to increase the availability of high quality imprint templates?
21. How important is it to improve the current selection of commercially available imprint resists and materials?
22. How big of an issue are problems of mold fill and/or shrinkage of the imprint resists?
23. How critical is it to improve current mold release coatings and strategies for NIL processes?
24. How important is it to improve the overlay technologies in current NIL tools?
25. How critical of an issue is it to more accurately quantify and control the fidelity of pattern transfer process in the NIL?
26. How critical of an issue is it to more accurately quantify and control the residual layer thickness in the NIL?
27. How important is it to increase the structural and/or chemical stability of nanoscale patterns fabricated by NIL?
28. How important is it to increase the mechanical properties of the patterns fabricated by NIL?

29. How important is it to better understand the chemistry of the cross-linking process in UV curable resists for nanoimprint lithography?
30. How important is it to increase the throughput of the current NIL tools?
31. How important is it to increase the imprint area of the current imprint tools?
32. How important is it to decrease the cost of the current imprint tools?
- 33. Do you have additional materials and/or metrology concerns with respect to NIL?**

NOTE: This survey contains collection of information requirements subject to the Paperwork Reduction Act. Notwithstanding any other provisions of the law, no person is required to respond to, nor shall any person be subject to penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act. The estimate response time for this survey is 10 minutes. The response time includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send Comments regarding this estimate or any other aspects of this collection of information, including suggestions for reducing the length of this questionnaire, to the National Institute of Standards and Technology, Attn., Christopher Soles, 100 Bureau Drive, Stop 8540, Gaithersburg, MD 20899-8540. The OMB number for this survey is 0693-0033, expiring on July 31, 2009.