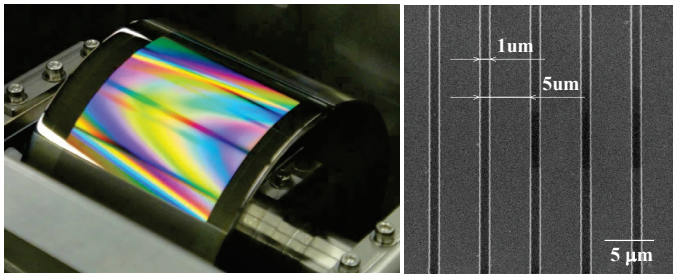
250mm wide Seamless Roller Mold

Using Fast EB Lithography (rEBL) for R2R Process

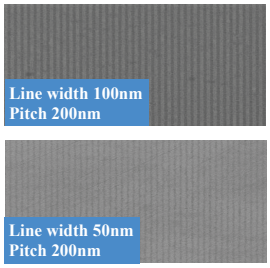
AsahiKASEI

More information about SRM : ped01-ml@aml.asahi-kasei.co.jp)
Asahi Kasei corporation, Corporate Production Technology Div.

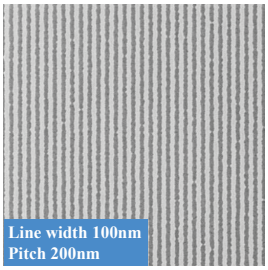
*Large-area **Seamless** Roller Mold (SRM)*
*with linewidth under **100nm***



<Dimensions of the roll are D:100[mm]/W:50[mm]>



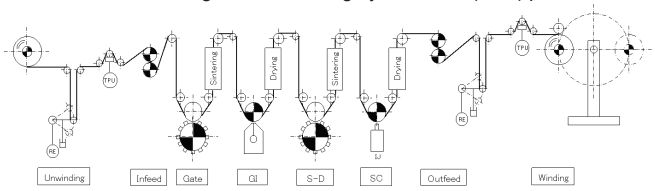
Resist pattern after development



Mold pattern after post-process

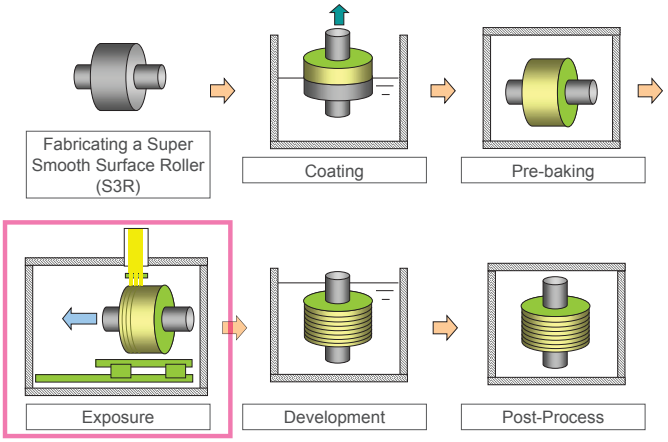
1. Introduction

Many companies and institutes are developing flexible electronics devices and optical devices. An important feature of flexible electronics is low cost, which is enabled through manufacturing by roll-to-roll (R2R) process.

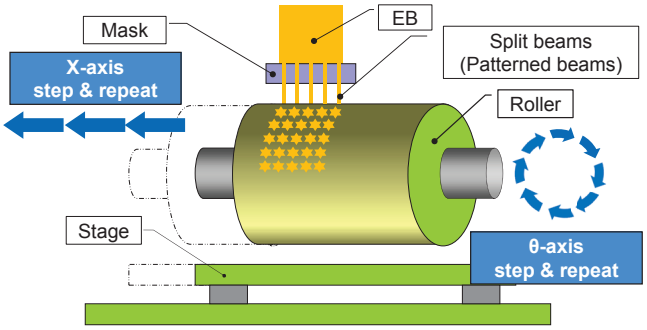


However, this R2R process requires a large-area seamless roller mold (SRM) which has not been easy to achieve. We have succeeded in the development to enable the achievement of such a SRM. This SRM's diameter is 100 mm, and roller width is 50 mm. On our recent work, we have succeeded to make 250mm wide SRM.

2. Process for SRM



3. Exposure method for periodic pattern



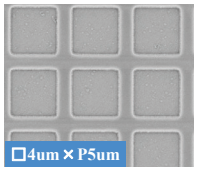
rEBL process can transfer the mask pattern to the roller surface at equal size. With this technology, any pattern on a mask can be transferred to a roll surface.

4. Experimental result

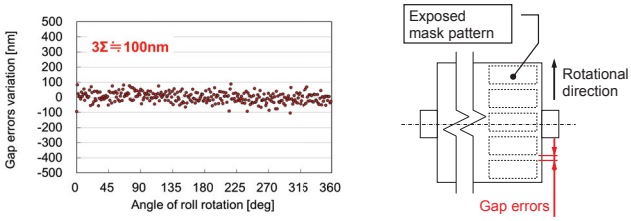
<Grid pattern , dimensions of the roll are D:100[mm]/W:50[mm]>

Resist	ZEP520A
Resist thickness	150 nm
Probe current	2.0 uA
Acc. voltage	5.0 kV
Dimensions of roll	D100 mm / W50mm
Throughput	150 min

Exposure conditions



Mold pattern after post-process

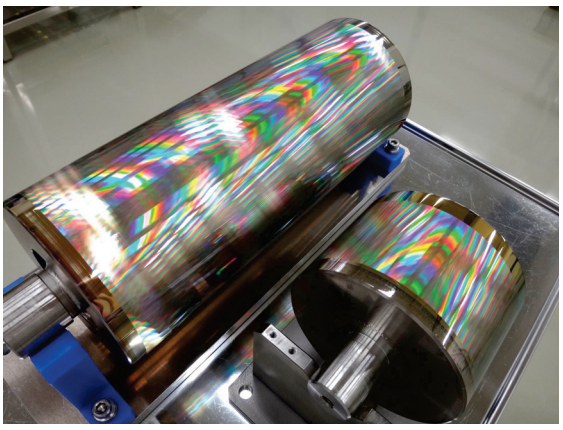


Gap errors variation compared with design value

We are making a big effort to achieve the higher resolution pattern (<100nm) and wider SRM for flexible electronics and R2R process.

5. Latest Work

we achieved to make 250mm-wide SRM



250mm-wide (left) and 50mm-wide (right) SRM

We have succeeded in fabricating the 250mm-wide SRM and several kind of patterns have exposed on the roller surface. The SRM can be used for the future R2R process to manufacture PE products.

High Resolution R2R printing technology

for Flexible sensors using Large Area Seamless Roller Mold

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1. Introduction

Many companies and institutes are developing flexible electronics devices and optical devices. At Asahi Kasei, we have successfully commercialized products such as Wire Grid polarization Film, and we are accelerating the development of other films for flexible electronics.

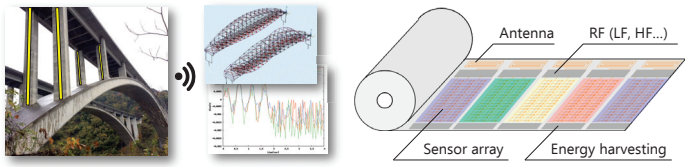


Image of Flexible sensor sheet

As you know 'High resolution and seamed' or 'Low resolution and seamless' imprinted films are reported in some previous studies. However 'High resolution and seamless' imprinted films are difficult to make because there was not such a seamless roller mold. We have developed large area seamless roller mold (SRM) using EB-Lithography and we have obtained 'High resolution and seamless' imprinted films using SRM and roll-to-roll (R2R) equipment.

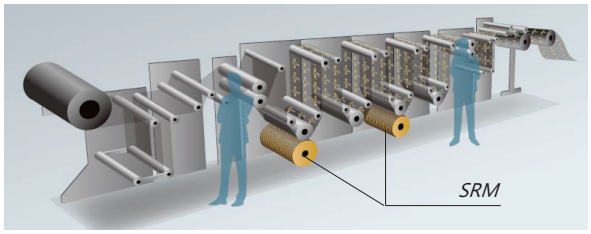
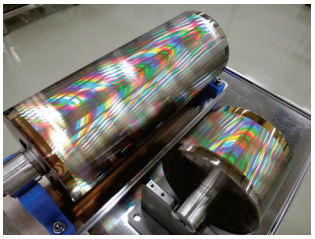


Image R2R PE process

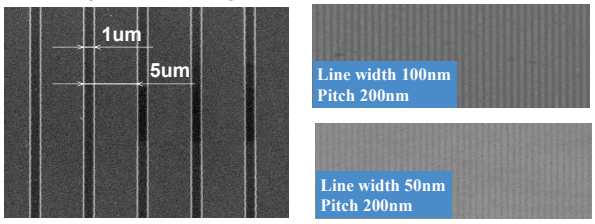
2. SRM and Pattern Variations

*Large-area **Seamless** Roller Mold (SRM)*
*with minimum line width under **100nm***
we achieved to make 250mm-wide SRM

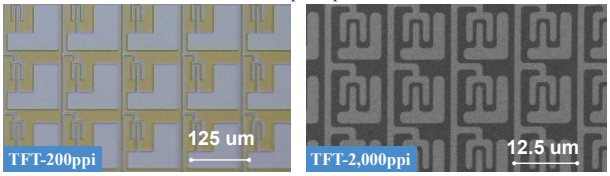


250mm-wide and 50mm-wide SRM

<Patterning variation sample>



line and Space patterns



TFT electrodes pattern

3. Imprinted and printed samples

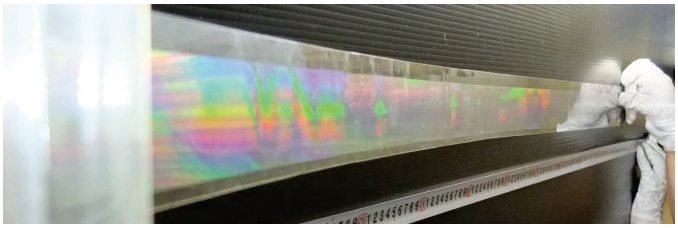
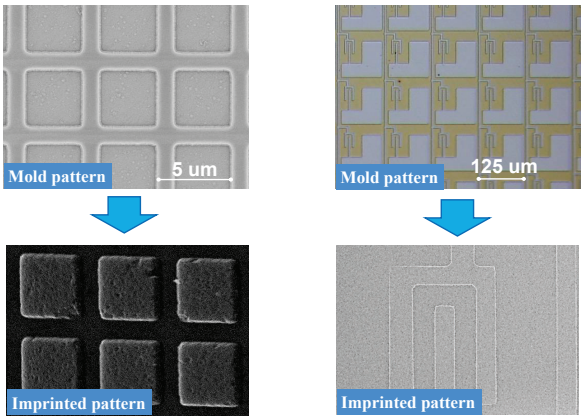
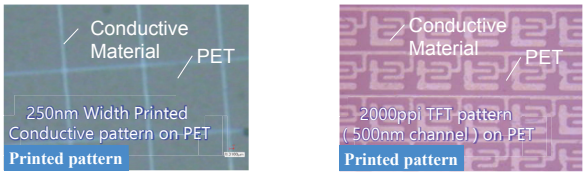


Photo of seamless imprinted patterns on PET film

< *Imprinted and Printed samples* >



Imprinted patterns using SRM (UV curable resign)



Printed patterns using SRM (Silver nano ink)

4. Roadmap

Asahi Kasei has been producing optical films and various kind of electric devices. We are going to produce further variety of products with R2R processes.
Now we are developing to make SRM larger and finer. It will be needed to realize future products. Near future, we will be able to show you the detail of a new SRM.