

High Temperature Embossing Apparatus with Ultrafine Shape Patterning

Dr. Jaejong Lee
Department of Nano Manufacturing Technology
T. +82 - 42 - 868 - 7145
E. jjlee@kimm.re.kr



⇒ Nano-microscale patterning technology on more than 6-inch substrates.

Client / Market

- Display manufacturer, flexible plate device manufacturer, Si solar cell and thin film solar cell manufacture, nano/bio device field and nano-manufacturing systems company

Necessity of this Technology

- Technology of an apparatus for patterning on a 6-inch wafer or flexible polymer-based substrate has been developed, but there is no any automated system technology that includes the ability to automatically and/or continuously feed substrates
- Suss Microtec in Germany and EVG in Austria have developed and commercialized the high temperature thermal-nanoimprint systems.
- These technologies have some limits, for example, the large diameter or width substrate and the stamp materials because it developed use for only some silicon wafers under vacuum environments condition in order to get rid of entrapped air bubbles between the stamp and the substrate. In the case of vacuum-based system, there are some problems to control the applied pressure.
- The nanopatterning process is not able to perform continuously by changing the stamps i.e. roll-shaped stamps and the substrates, and the extendibility of the systems is very low.
- Therefore, this technology could be overcome the limitations regarding the flexible stamp and enhances the pattern uniformity on the large area substrates.

Technical Differentiation

- It can be applied in various filed, because it has more various types of stamp or flexible stamps i.e. Ni, Si, Glass, PMMA, PC, PET can be utilized compared to existing apparatus. Also, the its extendibility can be enhanced through loading and unloading the flexible plate and adjustment of heating/cooling plate size to be applied for various research areas.
- By enlarge the heating/cooling plates, it can be performed on a large area up to 8 inches, and over 95% of pattern uniformity can be achieved for 50 nm pattern on the polymer coated substrates.

DESIRED PARTNERSHIP

Technology Transfer

Licensing

Joint Research

Other



TECHNOLOGY READINESS LEVEL [TRL]

Research, basic explanation | Project concept or idea development | Technology idea verification | Prototype development | Trial product production/evaluation in similar environment | Pilot field demonstration | Development and optimization of commercial model | Commercial product demonstration | Mass production and initial market launch

- It can be fabricated on some high aspect ratio nanostructures up to 8 inch substrate with faster heating and cooling speed.
- It can be applied in various filed, because it has more various types of stamp or flexible stamps i.e. Ni, Si, Glass, PMMA, PC, PET can be utilized compared to existing apparatus. Also, the its extendibility can be enhanced through loading and unloading the flexible plate and adjustment of heating/cooling plate size to be applied for various research areas.
- By enlarge the heating/cooling plates, it can be performed on a large area up to 8 inches, and over 95% of pattern uniformity can be achieved for 50 nm pattern on the polymer coated substrates.

Excellence of Technology

- As the results of many experiments using the developed systems, 50 nm nanostructure is well fabricated on the PMMA coated Si substrate and many polymer sheets using the high temperature embossing process. At these experiments, we fabricated it with pattern uniformity of over 96% on 6in substrate. Additionally, we developed the process technology of PMMA nanopatterning using the replicated polycarbonate stamp. Also, it can be adapted to fabricate some functional micro lens, Si and thin film solar cells on the several kinds of substrates.

Current Intellectual Property Right Status

PATENT

- Hot Plate and hot Embossing Nano Imprinting Lithography Apparatus Using Above Hot Plate (KR0761212)
- Hot Embossing Apparatus Using Automatic Transfer Method (KR0885670)