Replication of a precision 3-D microstructures by UV casting

Introduction

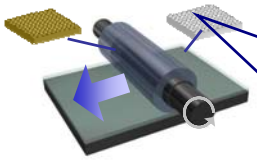
JPPN 2006-064455, JPAN 2004-277701

3-D Microstructures

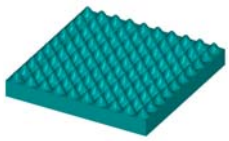
- Tribology
- Semiconductor devices
- Optical components
- Measurement benchmarks

Demand for high productivity
- High precision
- Large area
- High speed processes

Solution : REPLICATION



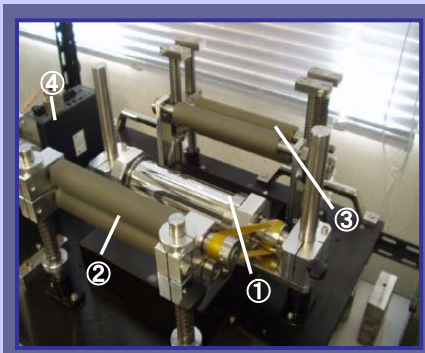
Schematic of replication



2-D Angle Grid

$$f(x,y) = A_1 \sin(\frac{2\pi}{\lambda_1} x) + A_2 \sin(\frac{2\pi}{\lambda_2} y)$$

A_1, A_2: ~0.1μm λ_1, λ_2: ~100μm



Roller replication machine

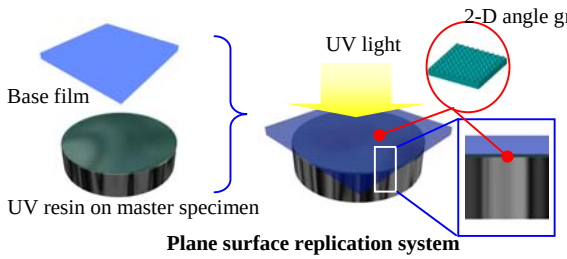
① 2-D angle grid roller
② Feed rollers
③ Tension rollers
④ Motor driver

Replication Experiments

Plane surface replication by UV

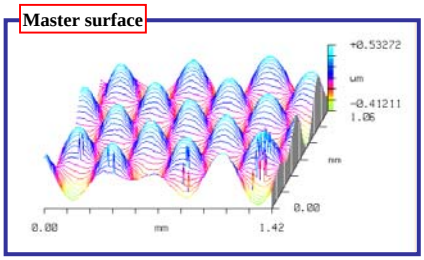
- Precision replication
- Fast curing
- Unheated
- Low-pressure

+ Basic system
Easy to get precision replica

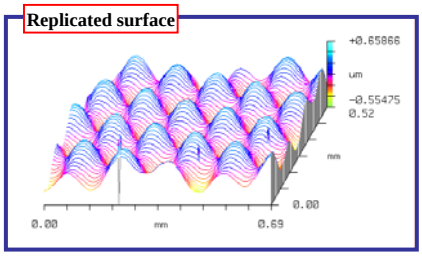


Plane surface replication system

Master surface



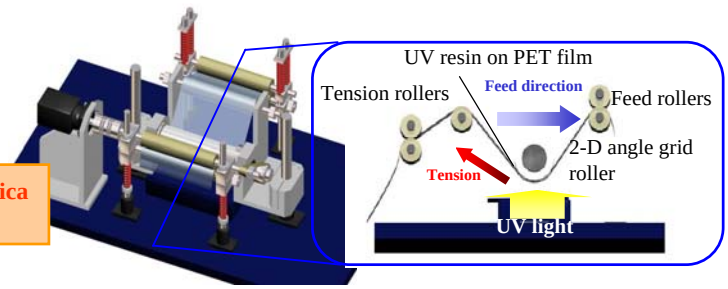
Replicated surface



Roller replication by UV

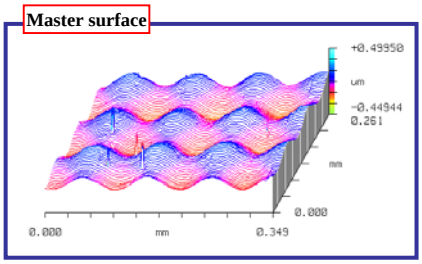
- Precision replication
- Fast curing
- Unheated
- Low-pressure

+ Unlimited area of replica
high throughput



Roller replication system

Master surface



Replicated surface