

A Study on the effect Phase-map by Sensitivity Vector in ESPI System

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Key words : ESPI, Sensitivity Vector, Phase-map, Fringe pattern

1.

0

ESPI

가

$$\beta = 0^\circ$$

PQ

ESPI

가

$$\Delta\phi = \frac{2\pi}{\lambda} [(\cos\alpha + 1)d_x] \quad (2.4)$$

가

가

2

Out-of-Plane ESPI

$$\Delta\phi = 2\pi N \quad (2.5)$$

$$(2.4) \quad (2.5)$$

2.

$$d_x = \frac{N\lambda}{\cos\alpha + 1} \quad (2.6)$$

가

$d_x$ :

가

가

$N$ :

$$\vec{K} = \vec{k}_2 - \vec{k}_1 \quad (2.1)$$

$\lambda$ :

Fig. 1

$\vec{d}_x$

$\alpha$ :

$$I = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos(\Psi + \Delta\phi) \quad (2.2)$$

3.

200 X 150 mm,

1mm

$$\Delta\phi = (\vec{k}_2 - \vec{k}_1) \cdot (\vec{r}_3 - \vec{r}_1) - \Delta k_1 \cdot \vec{r}_3 - \Delta k_2 \cdot (\vec{R} - \vec{r}_3) \quad (2.3)$$

400mW

Nd:YAG

$$(3.2) \quad \Delta \vec{k}_2 \cdot (\vec{R} - \vec{r}_3)$$

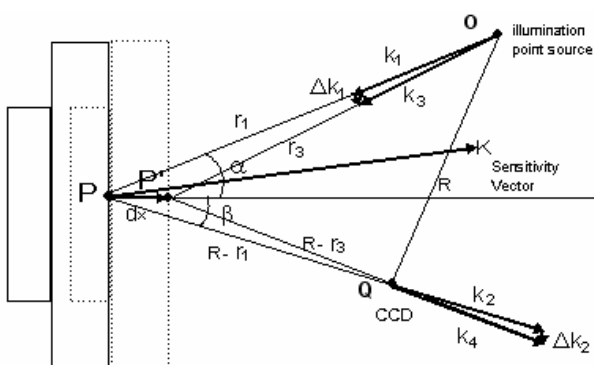


Fig. 1. Vector diagram showing sensitivity to displacement in out-of plane interferometry

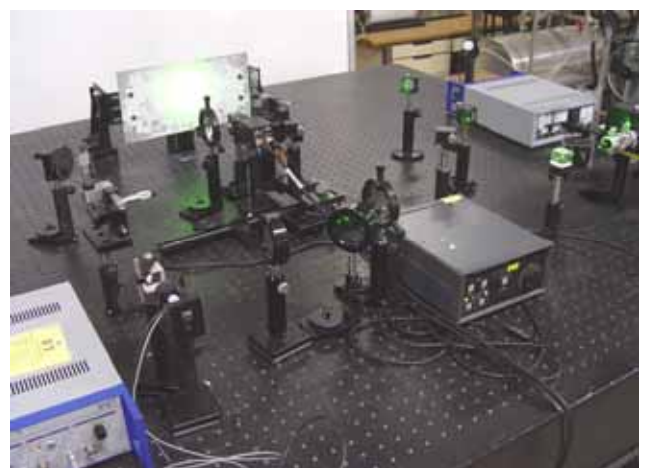


Fig. 2.. Out-of-Plane ESPI System

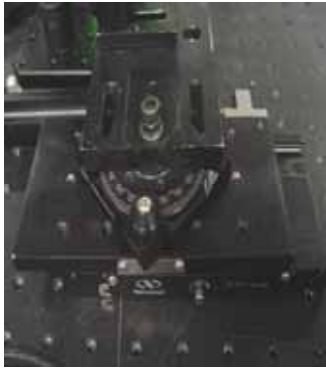


Fig.3. Trans-meter



Fig.4. Micrometer

$$\tan \theta = \frac{c}{a}$$

c= 36cm

a= (cm)

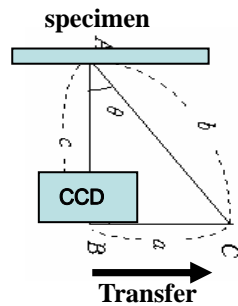


Fig.5. Angle Measurements

4.

Fig. 5

fringe

Table.

Fringe

Line-Profile

, Table. 2

1

0.5cm

Fringe 가

Fringe

Fig. 6~9

5.

ESPI

0

Fig. 6~9

Table.1. Fringe Number by Transfer distance & Angles

| Transfer (a,cm) | Angles ( $\theta$ ) | Fringe (nm) |
|-----------------|---------------------|-------------|
| 0(8)            | 12.5                | 2394        |
| 0.5(8.5)        | 13.2                | 2261        |
| 1(9)            | 14                  | 1995        |
| 1.5(9.5)        | 14.7                | 1542.8      |

Table.2

, 12.5

가

Fringe Pattern 가

data

가

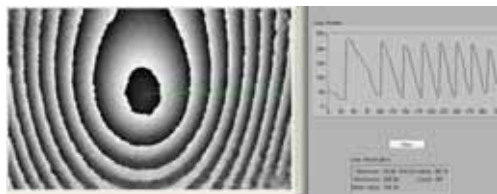


Fig. 6. Transfer 0cm, Angle 12.5

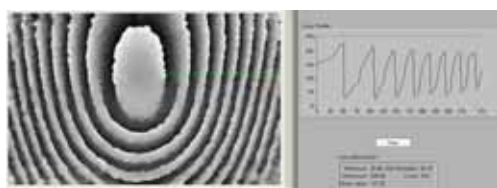


Fig. 7. Transfer 0.5cm, Angle 13.2

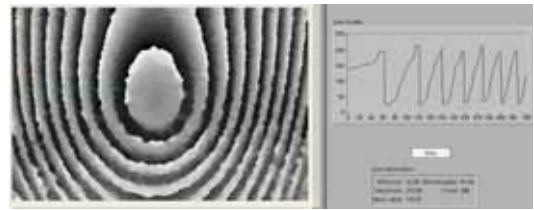


Fig.8. Transfer 1cm, Angle 14

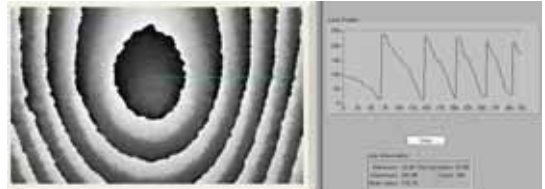


Fig.9. Transfer 1.5cm, Angle 14.7

Table.2. Error rats by Experiments Data

| Angles ( $\theta$ ) | Fringe (nm) | ( $\mu$ m) | (%)  |
|---------------------|-------------|------------|------|
| 12.5                | 2394        | 2.5        | 4.24 |
| 13.2                | 2261        | 2.5        | 9.56 |
| 14                  | 1995        | 2.5        | 20.2 |
| 14.7                | 1542.8      | 2.5        | 38.2 |

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