GMA08 – Riunione **Gruppo Materiali** AIMeTA
Genova, 29 Febbraio - 1 Marzo 2008

RESIDUAL THERMAL STRESSES IN A PERIODICALLY COATED ANISOTROPIC LAYER

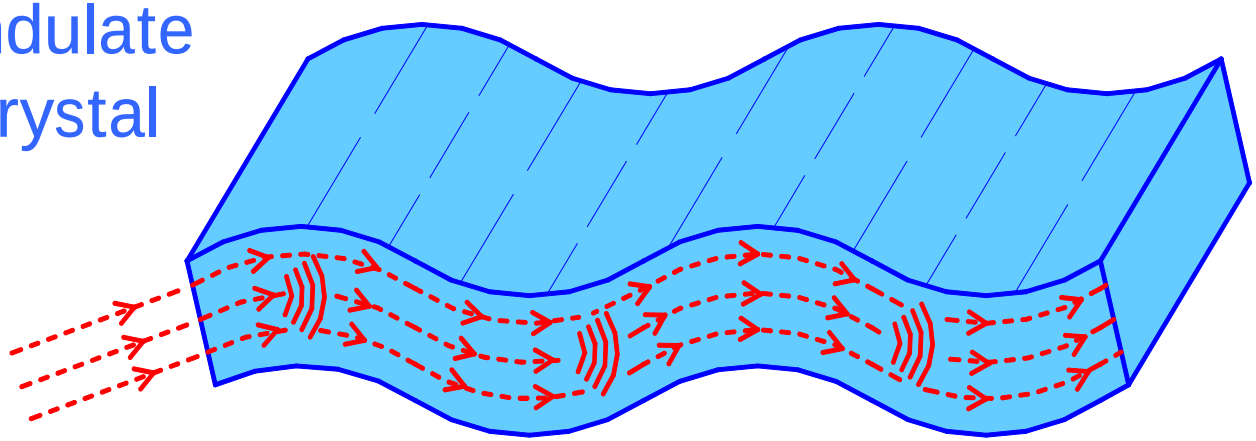
L. Lanzoni E. Radi

UNIVERSITA' DEGLI STUDI
DI MODENA E REGGIO EMILIA

Dipartimento di Scienze e Metodi dell'Ingegneria

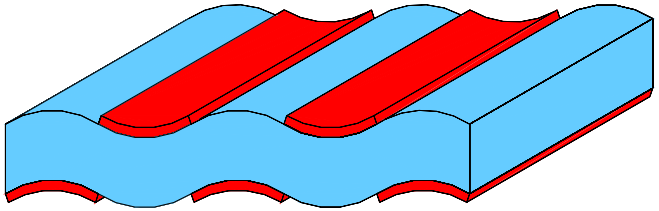
Crystalline undulator

ondulate crystal



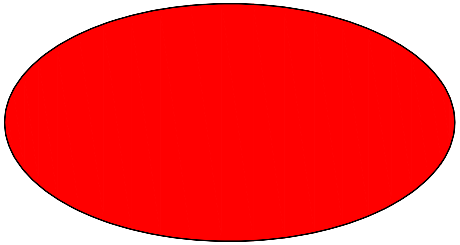
10÷100 GeV electrical charges

1 MeV X-rays and Gamma rays



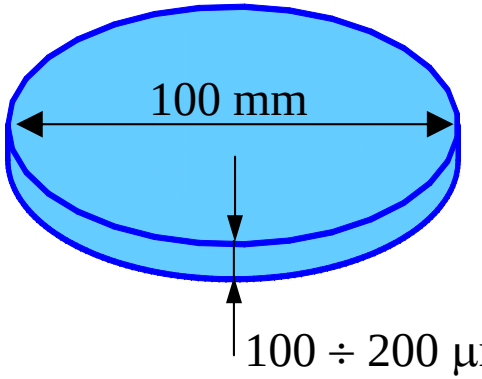
Undulator

Si_3N_4 film



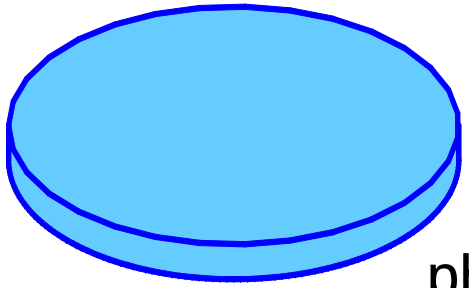
100 ÷ 400 nm

Si wafer



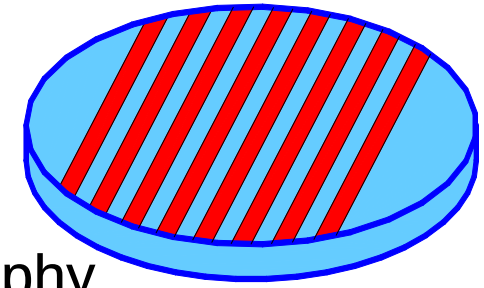
LPCVD

800 °C



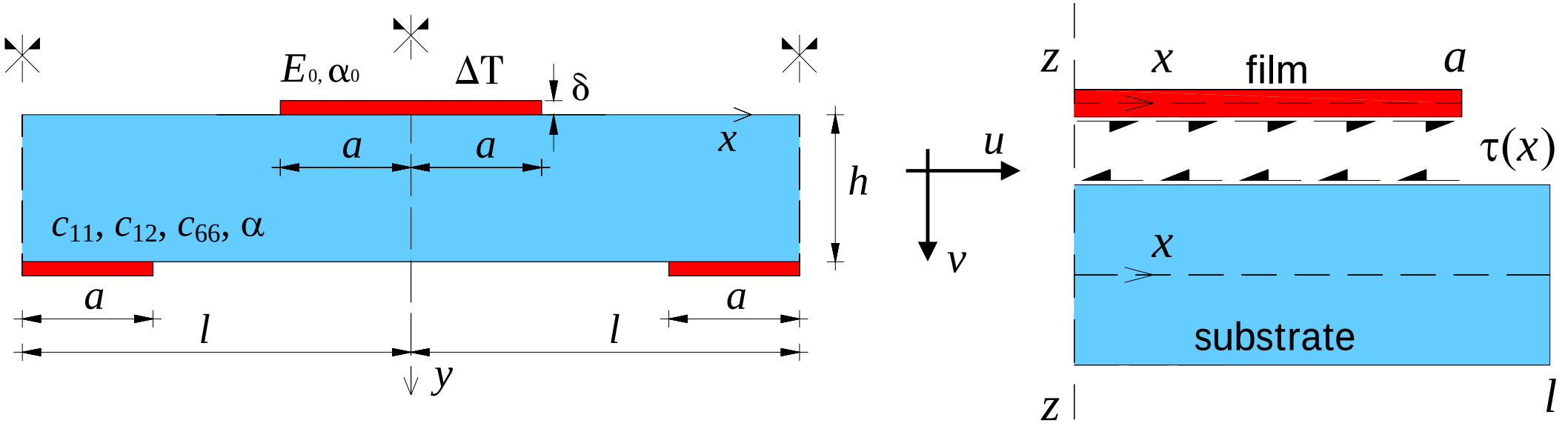
$-\Delta T$

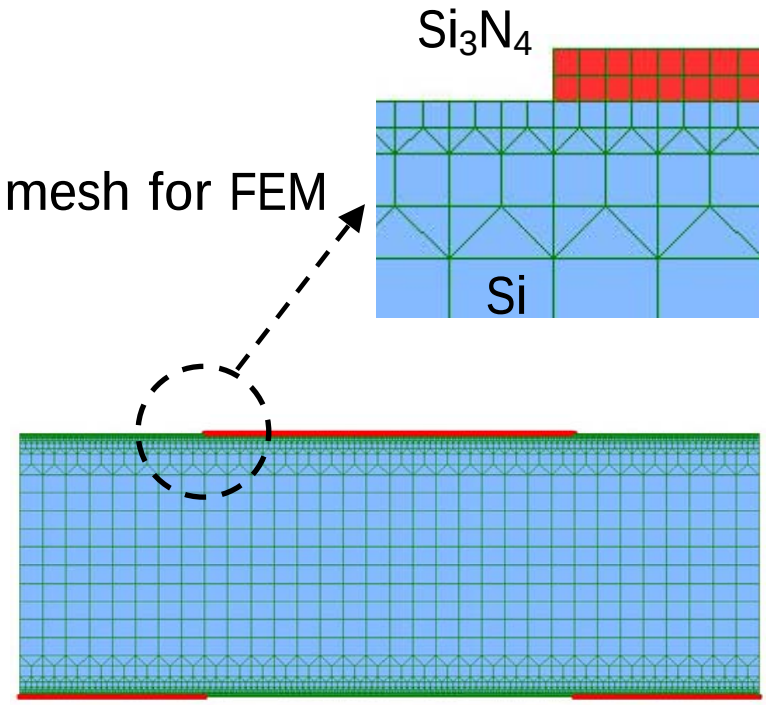
photolithography



GMA08

Analytic and FEM model





boundary conditions:

- $u(0, y) = u(\pm l, y) = 0, \quad \tau(0, y) = \tau(\pm l, y) = 0, \quad \text{for} \le y \le h,$
- $\sigma_y(x, 0) = \sigma_y(x, h) = 0, \quad \text{for } |x| \le l,$

adherence condition:

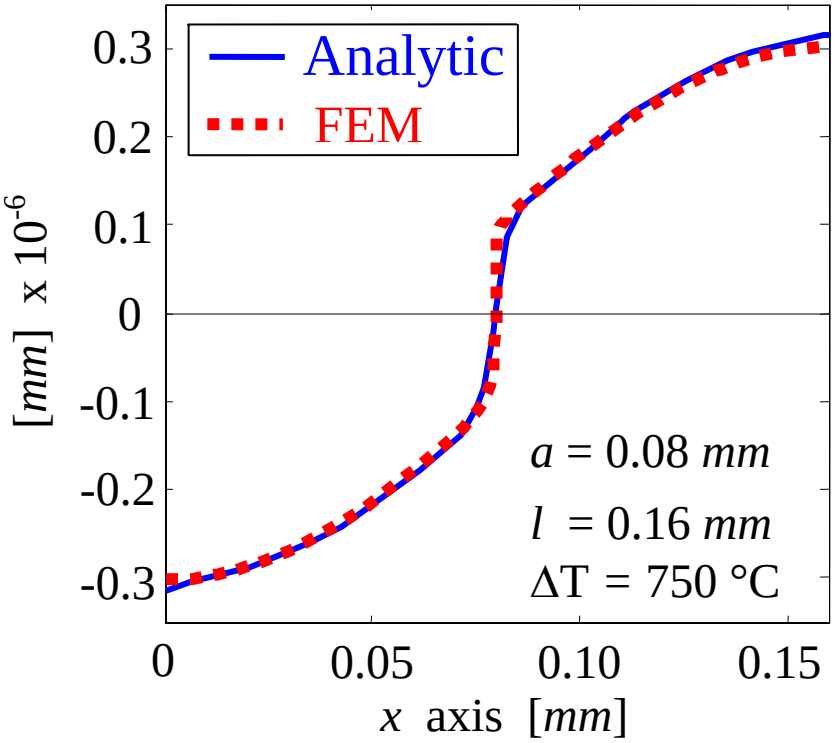
$u(x, 0) = u_0(x), \quad \text{for } |x| \le a; \quad u(x, h) = u_0(x) \text{ for } (l - a) \le |x| \le l$

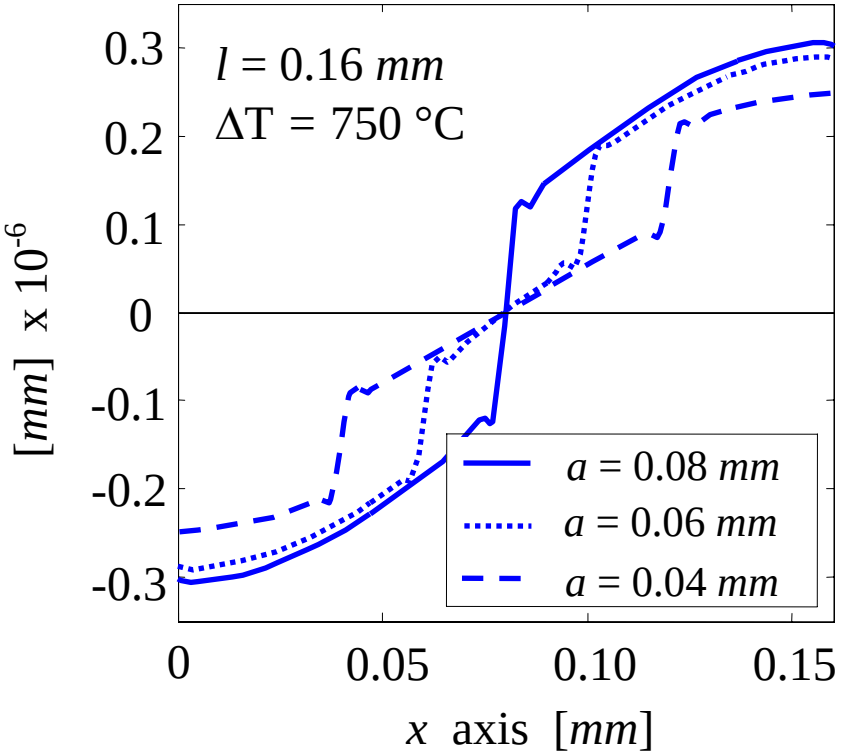
displacement field:

$$u(x, y) = \sum_{n=1,3,}^{\infty} U_n(y) \sin(n\pi x), \qquad v(x, y) = \sum_{n=1,3,}^{\infty} V_n(\bar{y}) \cos(n\pi x).$$

GMA08

Vertical displacement $v(x, 0)$





Future aims

- Take into account the variation of the mechanical properties of the deposed film (FGM film),
- take into account the microstructural effect (e.g. by using couple stress theory).