X-ray scattering,
$000006 C 00$ Rocking curve
0.00 o Bragg peak $(004)$


$2 \Delta d \sin \theta+2 d \cos \theta \Delta \theta=0$

$$
\begin{gathered}
\Delta d=-d \sin \Delta \theta \\
\cos \theta \\
N_{0}(001) \\
\hdashline
\end{gathered}
$$



Ga sb thickness fringes

Strained layers

$$
G e
$$



Si

$$
\begin{gathered}
0 \quad 0 \quad 0 \quad 00 \\
0 \quad 0 \quad 0 \\
\text { relaxed } \\
a_{z}=a_{x}=a_{y}
\end{gathered}
$$

biaxial
compresive strain

$$
a_{z}>a_{x}=a_{y}
$$




Higher mobility
less scattering


Critical Thickness


Electrical Charadterisalim
n v
Mobilily $\mu=\frac{v}{E}$
Curret $j=\sigma E ; \sigma=n e \mu$ i

$$
\mu=\frac{e(\tau)}{M^{*}}
$$




$$
\sigma_{x}=n e \mu
$$



Hall bar

4 probes elimitates contade renistance

$$
\begin{aligned}
& \stackrel{\substack{a \\
v q V_{y}}}{\stackrel{p B_{z} v_{x}}{V_{y}}=v_{x} B_{t} v_{x}} \quad R_{H}=\frac{V_{y}}{B_{z} j_{x}} \\
& \begin{aligned}
j_{x} & =n e v_{x} \\
& =n e \frac{V_{y}}{B_{z}} \\
\frac{v_{y}}{B_{z} j_{x}} & =\frac{1}{n e}=R_{\mu}
\end{aligned}
\end{aligned}
$$

$$
\begin{aligned}
& \sigma=n e \mu \\
& \mu=\sigma \cdot R_{H}
\end{aligned}
$$

Multiple carrier lopes

$$
j=\sum_{i} n_{i} q_{i} r_{i}
$$




Non-ohmil mare ${ }^{n}$ interesting

schottky


 Capacitance - Voltage

Magneto resistance.
Landau Lard's
cyclotron frequency
-B

$$
\omega_{c}=\frac{e B}{M^{x}}
$$

Cyclotron resonance


$$
\Rightarrow \begin{aligned}
& \text { Shubnibov-de the as } \\
& \sigma(B) \\
& \sigma \text { run }
\end{aligned}
$$

M(B) de Haas - van Alphen

