INTERNATIONAL ATOMIC ENERGY AGENCY
UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION

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SMR/94- 26

SPRING COLLEGE ON AMORPHOUS SOLIDS
AND THE LIQUID STATE
14 April - 18 June 1982

LUMINESCENCE AND SPIN RESONANCE IN AMORPHOUS SILICON

(Lecture III)

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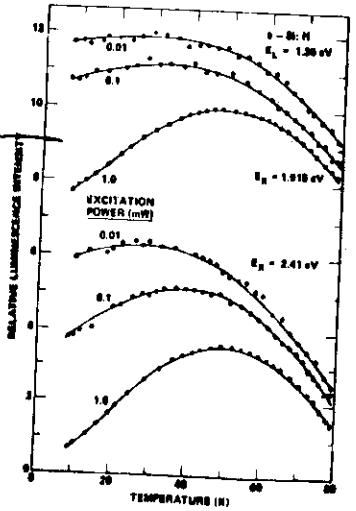
Thermal Quenching



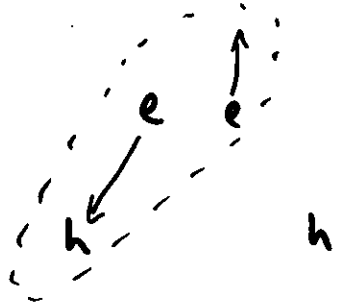
QUENCHING at Low TEMPERATURE

0 20 40 60 80
TEMP (K)

Effect disappears at low intensity

⇒ AUGER Recombination.

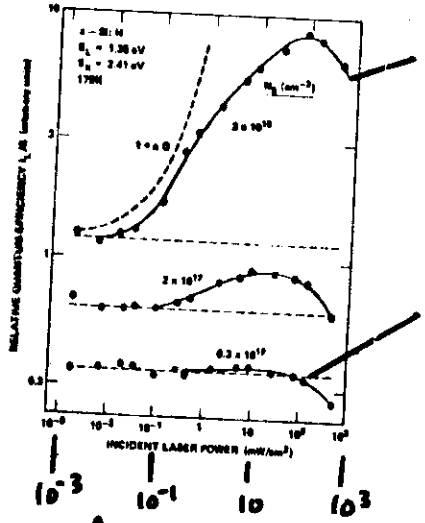
Occurs when electron-hole pairs overlap.



Recombination at high temperature

170K

LUM. Q.E. $\left(\frac{I_L}{G}\right)$

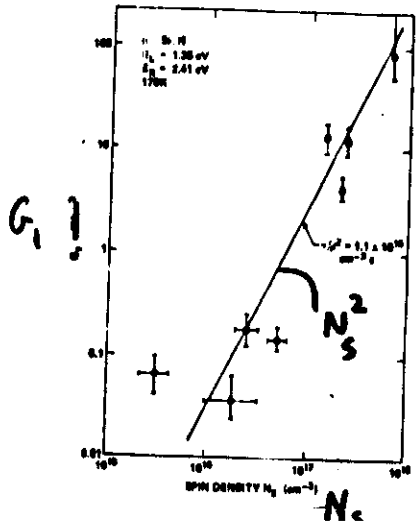


10^{-3} 10^{-1} 10 10^{3}

laser power (mW/cm²)

Model

Q.E. increases with incident power because of non-geminate recombination. If non-rad. recomb. @ at defects then predict-enhancement threshold $G_1 \sim N_s^2$

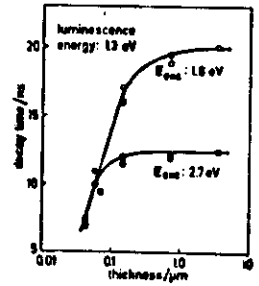


N_c

Surface Recombination

Not much information

Decay



Decay gets faster when thickness < 1000 Å

Comparison of Recombination Mechanisms in a-Si:H and Crystalline Semiconductors.

	Xtal	a-Si:H
Radiative processes		
Excitons		No
Rad. Tunneling (D-A pairs)		Yes (Band Tail states)
Phonon coupling (if ~~long-lived~~ deep states)		Yes
Non Rad.		
Deep defects		Yes if $N_s > 10^{17}$ cm^{-3}
Auger		Weak (because of small overlap)
Surface		Weak because of small diffusion length
Thermal Quenching		Yes