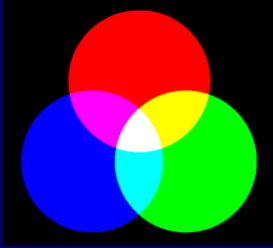



Making light




Hans U. Güdel
Department für Chemie und Biochemie

Seminar Fribourg, 13.10.2009



Making light



Password

Hitting the right spot

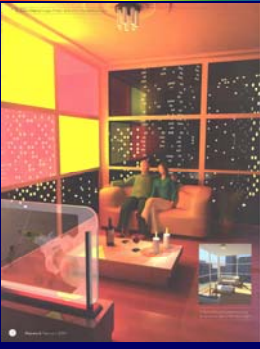
The race for white light

Navigating the airways

PHILIPS

2

Area illuminators



3

OLED Technology



4

Making light

- Light
- White and coloured light
- Photoluminescence, phosphors
- Spectrum
- Light emitting diodes (LED)
- Outlook

5

Making light

- Light

6

Fiat Lux


First Book Moses (Genesis), Chapter 1

- 1 in principio creavit Deus caelum et terram
- 2 terra autem erat inanis et vacua et tenebrae super faciem abyssi et spiritus Dei ferebatur super aquas
- 3 dixitque Deus fiat lux et facta est lux
- 4 et vidit Deus lucem quod esset bona et divisit lucem ac tenebras

7

Black body radiation

Temperature: 2500°C

Colour: 


5000°C

7500°C

8

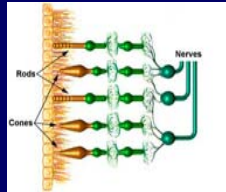
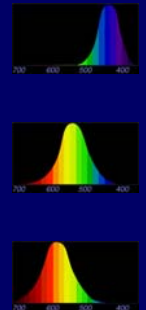
Black body radiation

Temperature: 5000°C

Colour: 

9

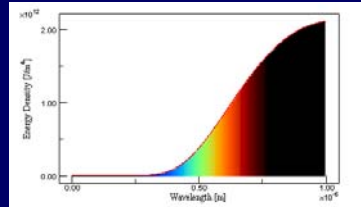
Human eye photoreceptors

10

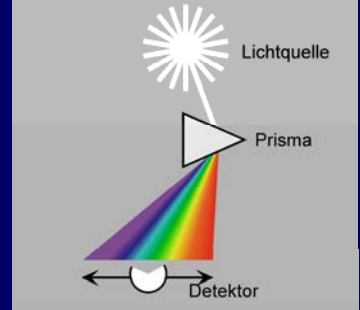
Incandescent lamp

2500°C

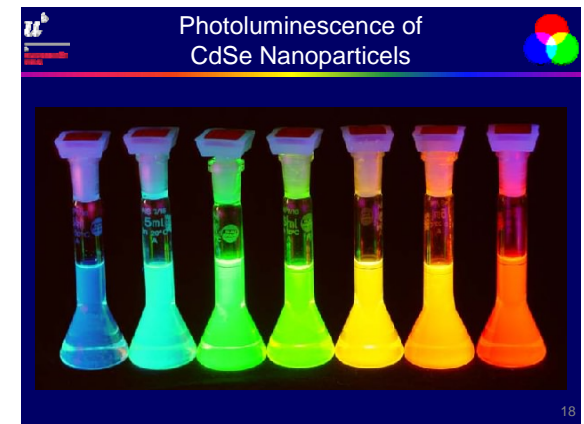
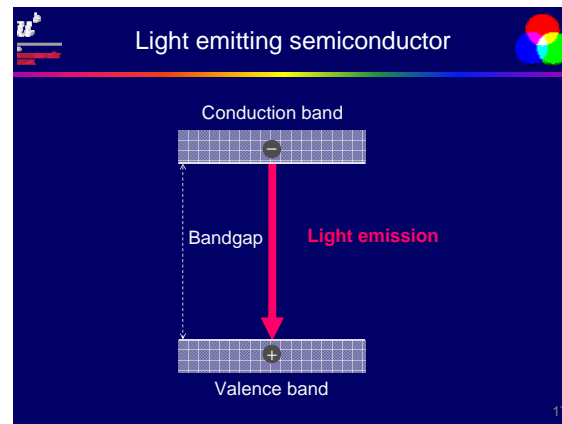
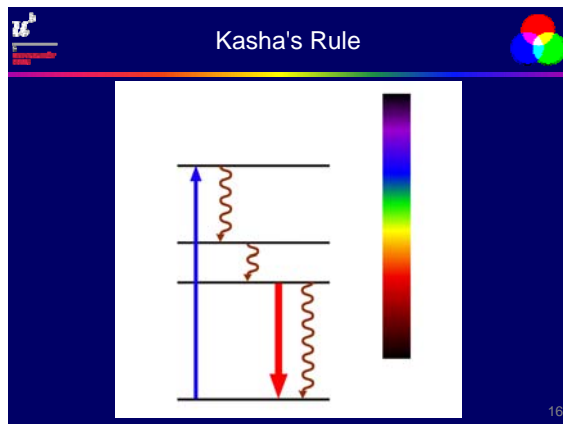
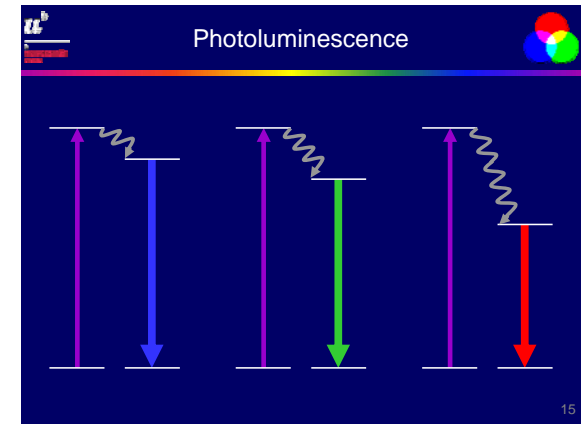
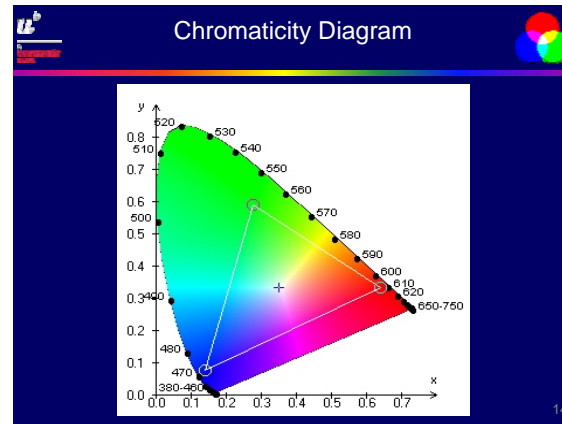
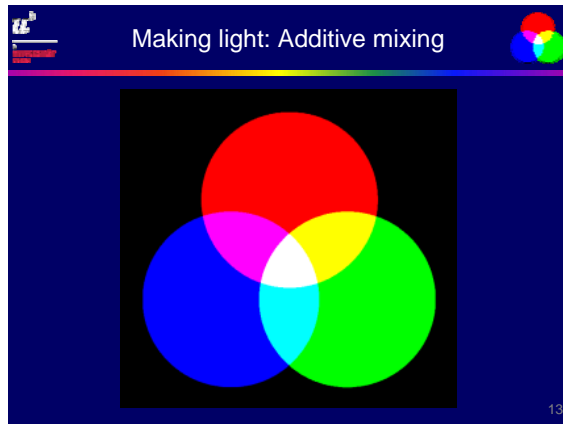


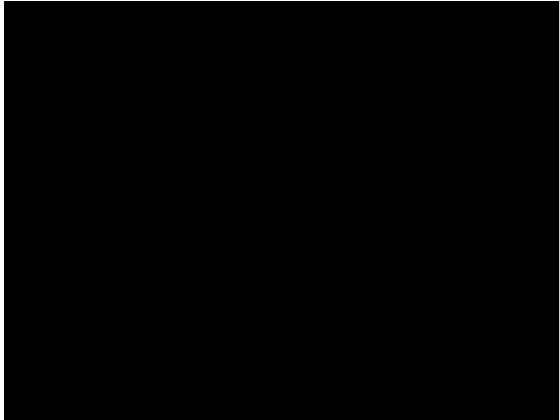
11

Dispersion of white light



12



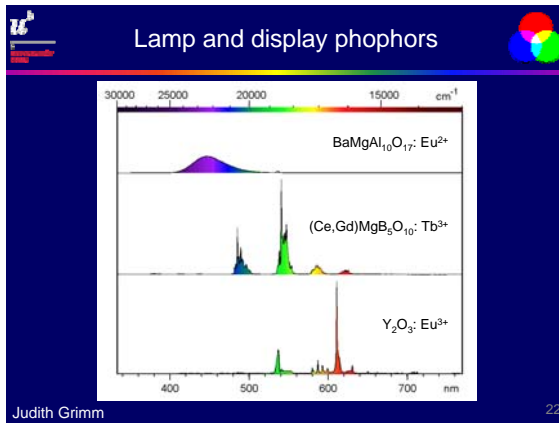


Fluorescent lamp

20

Luminescent phosphors

21



The Lanthanides

23

Coloured light

24

LED based technology

A large LED display in a stadium showing a soccer match. The display is labeled "Hanil Display". The score is 17:48, 00, KOREA 0, CHINA 0.

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Light emitting diodes (LED)

Inside a Light Emitting Diode

- Emitted Light Beams
- Diode
- Transparent Plastic Case
- Terminal Pins

Conduction band

Bandgap Electroluminescence

Valence band

26

LED Materials

Inorganic

III - V Semiconductors
Al, Ga, In N, P, As, Sb

- Al Ga As ●
- Al Ga In P ●
- Al Ga P ●
- Ga N ●

Organic (OLED)

Polymeric luminescent molecules with conjugated electron systems

Polyphenylvinylene

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Light emitting polymer

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Mirco Colombo citations, 3 papers

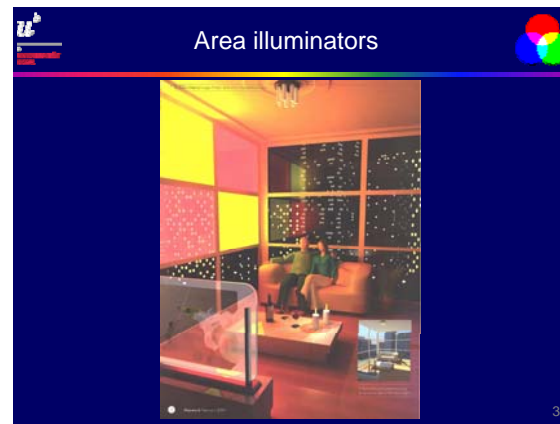
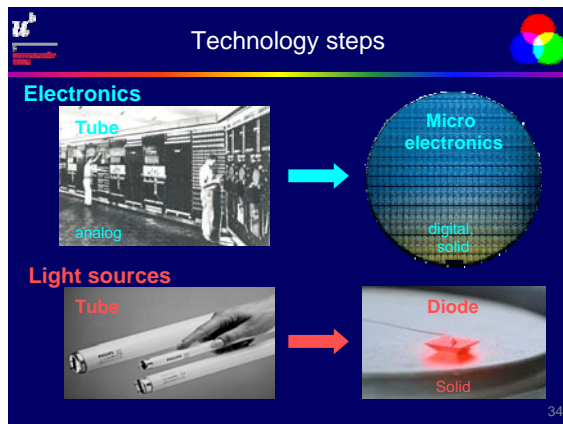
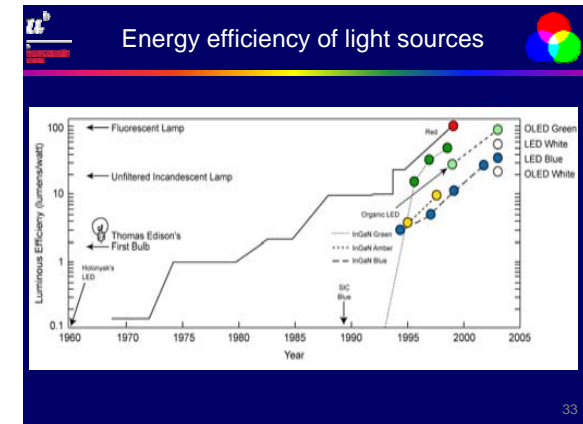
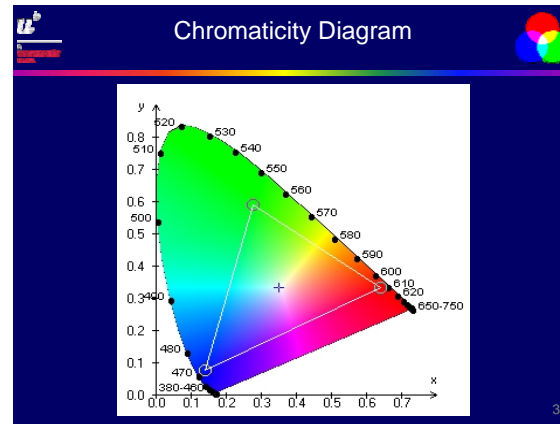
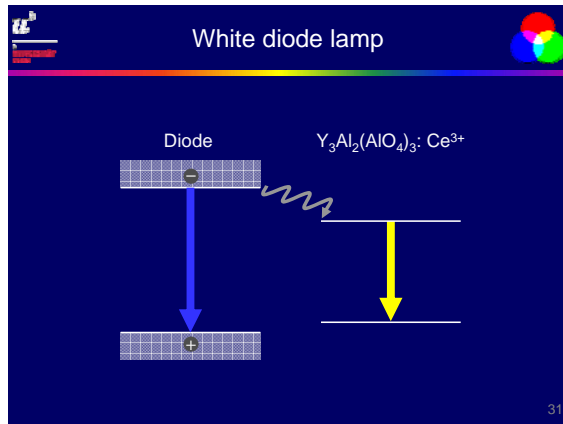
Citations in Each Year

Year	Citations
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1994	2
1995	15
1996	10
1997	10
1998	5
1999	5
2000	10
2001	15
2002	18
2003	25
2004	45
2005	40
2006	40
2007	38
2008	35
2009	40

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Diode spectra

30



Acknowledgment

Gabriela Frei

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