

Élelmiszerminősítési módszerek

Fénytan, szintan

Készült az ETEMNFA06BM Élelminősítési módszerek
tantárgy oktatása céljára

Ez az anyag a Kertészeti és Élelmiszeripari Egyetem jogutódjánál az
Élelmiszertudományi Karon oktatás céljára készült.
Ezen a területen korlátlanul felhasználható.
Anyagi ellenszolgáltatásért forgalomba hozni tilos.





Fotometria

- In 1979, because of the experimental difficulties in realizing a Planck radiator at high temperatures and the new possibilities offered by radiometry, i.e. the measurement of optical radiation power, the 16th CGPM (1979, Resolution 3 ; CR , 100 and *Metrologia*, 1980, 16, 56) adopted a new definition of the candela:
- **The candela is the luminous intensity, in a given direction, of a source that**
- **emits monochromatic radiation of frequency $540 \cdot 10^{12}$ hertz and that has**
- **a radiant intensity in that direction of 1/683 watt per steradian.**

Basisgröße: Lichtstärke

Basiseinheit: Candela

Symbol: cd

Definition:

1 Candela ist die Lichtstärke in einer bestimmten Richtung einer Strahlungsquelle, die monochromatische Strahlung der Frequenz 540 THz aussendet und deren Strahlstärke in dieser Richtung $1/683 \text{ W/sr}$ beträgt.

Grandezza: luminosa

Nome: candela

Simbolo: cd

Definizione:

"la candela è l'intensità luminosa, in una data direzione, di una sorgente che emette una radiazione monocromatica di frequenza 540×10^{12} hertz e la cui intensità energetica in quella direzione è $1/683$ watt allo steradiante"

Unité SI d'intensité lumineuse:

La candela est l'intensité lumineuse, dans une direction donnée, d'une source qui émet un rayonnement monochromatique de fréquence 540×10^{12} hertz et dont l'intensité énergétique dans cette direction est $1/683$ watt per stéradian

Международная система единиц

| meny nyiség | mérték- egység | величина | единица | сигнал единицы |
|----------------|-------------------|------------------------|-----------|-------------------|
| l | m | длина | метр | М |
| m | kg | масса | килограмм | КГ |
| t | s | время | секунда | с |
| I | A | ток | ампер | А |
| T | K | температура | кельвин | К |
| n | mol | количество вещества | моль | МОЛЬ |
| I_v | cd | сила света | кандела | КД |
| α | rad | плоский угол | радиан | рад |
| Ω | sr | телесный угол | стерадиан | ср |

Кандела равна силы света

Кандела – это сила света в заданном направлении источника, испускающего монохроматическое излучение частотой $540 \cdot 10^{12}$ Гц, энергетическая сила света которого в этом направлении составляет $1/683$ Вт/ср.

- Je to svietivosť (intenzita svetla) v danom smere zo zdroja, ktorý vyžaruje monochromatické žiarenie o frekvenci 540×10^{12} Hz a má žiarivosť (žiarivú intenzitu) v tomto smere $1/683$ W na jeden steradián

**Résolutions adoptées
par la Conférence générale
des poids et mesures (24^e réunion)
Paris, 17-21 octobre 2011**

Comité international des poids et mesures

24th meeting of the General Conference on Weights and Measures

the luminous efficacy K_{cd} of monochromatic radiation of frequency 540×10^{12} Hz is exactly 683 lumen per watt

24th meeting of the General Conference on Weights and Measures

the candela, symbol cd, is the unit of luminous intensity in a given direction; its magnitude is set by fixing the numerical value of the luminous efficacy of monochromatic radiation of frequency 540×10^{12} Hz to be equal to exactly 683 when it is expressed in the SI unit

$\text{m}^{-2} \text{kg}^{-1} \text{s}^3 \text{cd sr}$, or
 cd sr W^{-1} , which is equal to
 lm W^{-1} .

Forrásmunkák

- SI mértékegység-rendszer (Bureau International de Poids et Measures)
- National Institute of Standards and Technology
- Commission Internationale de l'Éclairage
- Commission Électrotechnique Internationale
- Code of Federal Regulations, Food and Drug administration, FDA
- EINECS European Inventory of Existing Commercial Chemical Substances
INS International Numbering System for Food Additives

A betanin engedélyezett színezék E162

Colour Index 2.0 - Colour Index Base Set

File Search... Text Report View Windows Help



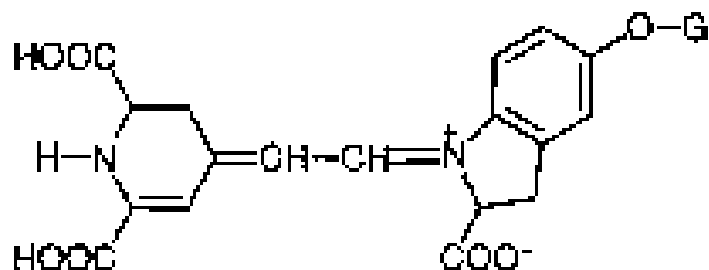
Beetroot Powder 42047

C.I. 75840

C.I. Natural Red 33

Disclosed by DFA

Common name **Betanine**



Present, with the aglycone, in red beetroot (*Beta vulgaris*).

Forrásmunkák

- MSz 9620 Fotometria
- MSz 7300 COLOROID
- CIE Publ. 17.4-IEC Publ. 50(845) International Lighting Vocabulary
- MSZ ISO 11037:2001 Érzékszervi vizsgálat. Általános útmutató és vizsgálati módszer az élelmiszerek színének megállapítására
- Colour Index Constitution Number
- Chemical Abstract Registry number (CAS)

Forrásmunkák

- Colour Index International
- Society of Dyers and Colourists SDC
- American Association of Textile Chemists and Colorists AATCC
 - ❖ Colour Index Generic Names
 - ❖ Colour Index Constitution Numbers

Forrásmunkák

- International Standards Organisation (ISO)
- European Colour Fastness Establishment (ECE)
- European Committee for Standardisation (CEN)
- Commission International de l'Eclairage (CIE)
- British Standards Institute (BSI)
- Magyar Kereskedelmi engedélyezési Hivatal
(Hungarian Trade Licencing Office), volt OMH
Metrológiai főosztály
Elektromos, Hőfizikai és Optikai Mérések Osztálya

Forrásmunkák

- MSZ 20668-1:1979 Színezett élelmiszerek színezék- és festéktartalmának meghatározása. Vízben oldódó szintetikus színezékek meghatározása
- MSZ 20670-1:1983 Élelmiszer-színezékek és -festékek vizsgálata. Vegyi (szintetikus) úton előállított mesterséges, szerves színezékek azonosítása
- MSZ 20670-2:1966 Élelmiszer-színezékek és -festékek vizsgálata. A természetes színezékek és festékek
- MSZ 20670-3:1982 Élelmiszer-színezékek és -festékek vizsgálata. Éterben oldódó rész meghatározása
- MSZ 20670-4:1982 Élelmiszer-színezékek és -festékek vizsgálata. Kísérőanyagok meghatározása mesterséges színezékekben
- MSZ 20670-5:1983 Élelmiszer-színezékek és festékek vizsgálata. Színezéktartalom meghatározása

Forrásmunkák

- MSZ 8761-6:1993 Sör. A szín meghatározása
- MSZ-08-1279:1980 Cukorszínezék (karamell- és kulőroldat)
- MSZ 9681-5:1976 Fűszerpaprika őrlemény vizsgálata. Összes színezéktartalom meghatározása
- MSz 17066 Biztonsági szín- és alakjelek
- MSz 8600 Ipari festékek színválasztéka
- MSz 2100 Gépek villamos berendezése

Forrásmunkák

- <http://elfiz2.kee.hu/cgi-bin/eec.pl/eec/eec>
- http://elfiz2.kee.hu/e_code
- <http://physics2.kee.hu>
- <http://elfiz2.kee.hu/aic/dok/>
- <http://vision.vein.hu/~schanda>
- <http://virt.uni-pannon.hu/index.php/tanszek/oktatoi-oldalak>

| | |
|--------|-----------------|
| UV-C | 100-280 nm |
| UV-B | 280-315 nm |
| UV-A | 315-400 nm |
| ibolya | 380-440 nm |
| kék | 440-495 nm |
| zöld | 495-558 nm |
| sárga | 558-640 nm |
| vörös | 640-780 nm |
| IR-A | 780-1400 nm |
| IR-B | 1400-3000 nm |
| IR-C | 3000-1000000 nm |

Lukács Gyula, 2003:

A Szótárat, mint nemzetközi szabványt Magyarországnak is honosítania kellett, ami az MSZ 9620 szabvánnyal meg is történt. A magyar fordítás Megjegyzésébe be lehetett volna venni, hogy a magyarban a *szín* szó magában való használatát kerülni kell és mindenütt a *színészlelet* illetve *színinger* szavakat célszerű használni, a szabványt honosító magyar bizottság azonban ezt a javaslatot nem fogadta el. Így a hazai szakmai konferenciák előadásain továbbra sem lehetett tudni, hogy az előadó színészleletre vagy színingerre gondolt, amikor a szín szót említette.

International Lighting Vocabulary

| Fizikai mennyiségek | Pszichofizikai mennyiségek | | Színészlelet |
|---|--|--|---|
| radiometria | fotometria | színinger metrika | pszichológiai jellemzők |
| optikai sugárzás (1 nm λ <math><1\text{ mm}</math>) | látható sugárzás (380 nm <math><\lambda</math> <math><780\text{ nm}</math>) | színinger CIE 1391 (1964) színinger mérő rendszer | vizuális megjelenés |
| | spektrális fényhatásfok, láthatósági függvény $V(\lambda), V'(\lambda)$ | színinger összetevők X, Y, Z | |
| sugárerősség | fényerősség | CIELAB színinger mérő rendszer L^*, a^*, b^* | színészlelet |
| sugáráram | fényáram | | |
| sugársűrűség | fénysűrűség | | |
| besugárzás | megvilágítás | | |
| | | CIE 1976 világossági tényező, L^* CIELAB színezeti szög, h_{ab} CIELAB króma, C_{ab}^* | világosság színezet színezetdúság |
| | | CIELAB színinger különbség, ΔE_{ab}^* | színészlelési különbség |

Members of the Technical Committee of 1st Division of CIE (Colour)

| | | |
|--------|----------------|----|
| P.J. | Alessi | US |
| E.C. | Carter | US |
| M.D. | Fairchild | US |
| R.W.G. | Hunt | GB |
| C.S. | McCamy | US |
| B. | Kránícz | HU |
| J.R. | Moore | GB |
| L. | Morren | BE |
| J.H. | Nobbs | GB |
| Y. | Ohno | US |
| M.R. | Pointer | GB |
| D.C. | Rich | US |
| A.R. | Robertson | CA |
| J.D. | Schanda chair† | HU |
| T. | Seim | NO |
| R. | Sève | FR |
| P.W. | Trezona | GB |
| K. | Witt | DE |
| H. | Yaguchi | JP |

Yoshi Ohno

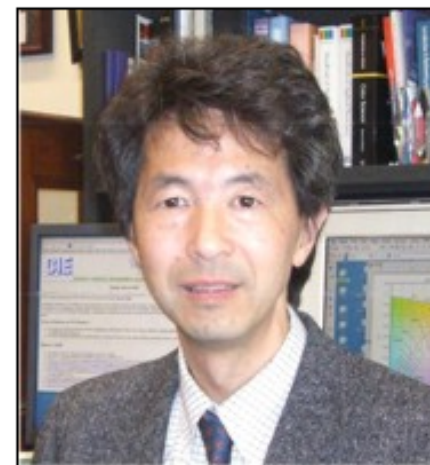
Yoshi Ohno is actively involved in research pertaining to photometry and colorimetry. Specific projects of interest include integrating sphere, luminous flux measurement, colorimetry of light sources, color rendering, spectroradiometry, photometry of flashing lights, and solid state lighting.

He is a Fellow of [IESNA](#), currently serves as the Director of CIE Division 2, NIST representative for [CCPR](#), Chair of CCPR Working Group of Key Comparisons, and active in technical committees in [CIE](#), [ISO](#), [ANSI](#), and IESNA.

Ohno received Arthur S. Flemming Award in 2006, CIE de Boer Gold Pin Distinguished Service Award in 2007, and U.S. Department of Commerce Silver Medal Award in 2009.

Selected Publications

- [Spectral Colour Measurement](#), ed. by J. Schanda
- [Spectral Design Considerations for White LED Color Rendering](#)
- [Detector-Based Luminous Flux Calibration Using Absolute Integrating Sphere Method](#)

**Position:**

Group Leader
Optical Technology Division
Optical Sensor

Employment History:

1992-present, NIST, Gaithersburg, MD
prior to 1991, Matsushita Electric

Dr. George P. Eppeldauer

George Eppeldauer's research area is in detector metrology developing transfer and working standard optical radiometers, photometers, and colorimeters and realizing detector responsivity based scales. The standards he has developed have been utilized to improve the two NIST SI units, the candela and kelvin, the illuminance responsivity scale, the tristimulus color scale, the spectral power, irradiance, and radiance responsivity reference-scales, and the spectral irradiance scale. He was one of the three pioneers who developed the [SIRCUS](#) reference responsivity-calibration facility. He won the Best Paper Award at the [NCSLI](#) Conference in 2004 and he chairs the CIE TC2-48 Technical Committee (TC) on Spectral Responsivity Calibrations and the CIE TC2-29 TC on Detector Linearity.

His present research projects are:

- [Detector metrology](#)
- [Transfer and working standard radiometers and photometers](#)
- [Detector-based color scale](#)
- [Night vision goggle calibrations](#)
- [Infrared spectral responsivity calibrations](#)



Position:

Electronics engineer
Optical Technology Division
Optical Sensor

Employment History:

1986-present, NIST, Gaithersburg, MD

1967-1986, Research Institute for
Technical Physics at the Hungarian

CURRICULUM VITAE of Dr. János Schanda

Dr. János Schanda is Professor Emeritus of the University of Veszprém, Hungary.

He graduated in physics at the Loránd Eötvös University in Budapest.

His first employer was the Hungarian Office of Measures, where he dealt with photometric measurements, but he joined soon the Research Institute for Technical Physics of the Hungarian Academy of Sciences, where he first dealt with ZnS electro-luminescence.

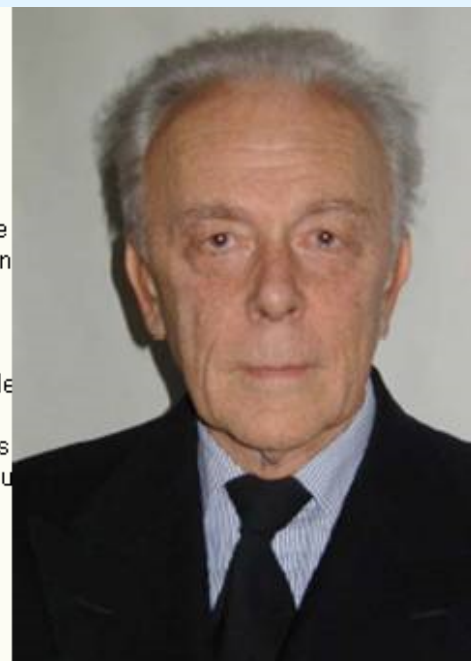
His PhD thesis dealt with the "Spectroradiometric Investigation of Electroluminescence".

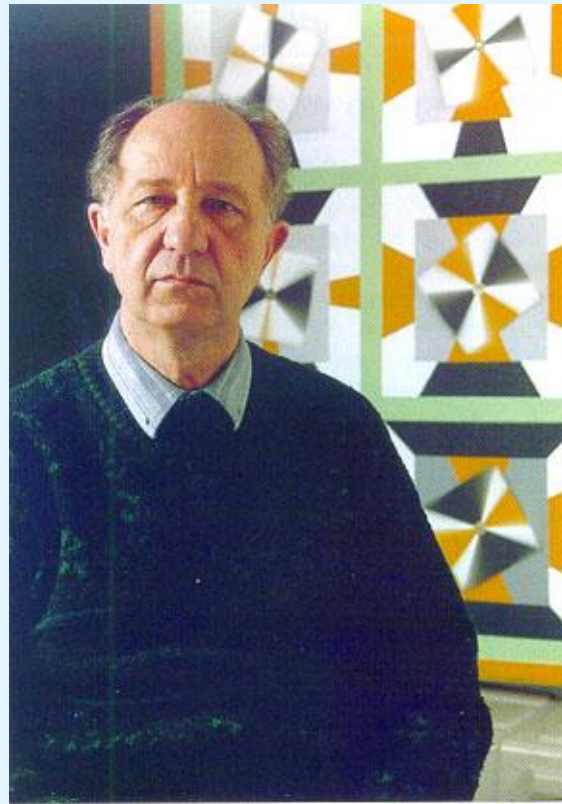
The Hungarian Academy of Sciences granted him the degree of "Doctor of Technical Sciences" for his thesis work on colour rendering.

He retired from the Institute as Head of the Department of Optics and Electronics and joined the University of Veszprém as professor of informatics. He headed there the Department of Image Processing and Neurocomputing. Since retirement he is Professor Emeritus and advisor for the "Colour and Multimedia Laboratory".

During the nineteen eighties and nineteen nineties he worked for the International Commission on Illumination (CIE) as its General Secretary and later technical manager. He functioned also in a number of honorary positions of the CIE. At present he is the Secretary of the Commission, its past Vice President, chaired and chairs several Technical Committees, among others dealing with fundamentals of photometry, colorimetry and colour rendering. At present he is the President of the Hungarian National Committee of the CIE.

Dr. Schanda is member of the Optical Society of America, of The Society for Imaging Science and Technology and of several Hungarian Societies in the fields of light and lighting and optical measurement. He served also on the Board of the International Colour Association (AIC) as its vice-president.





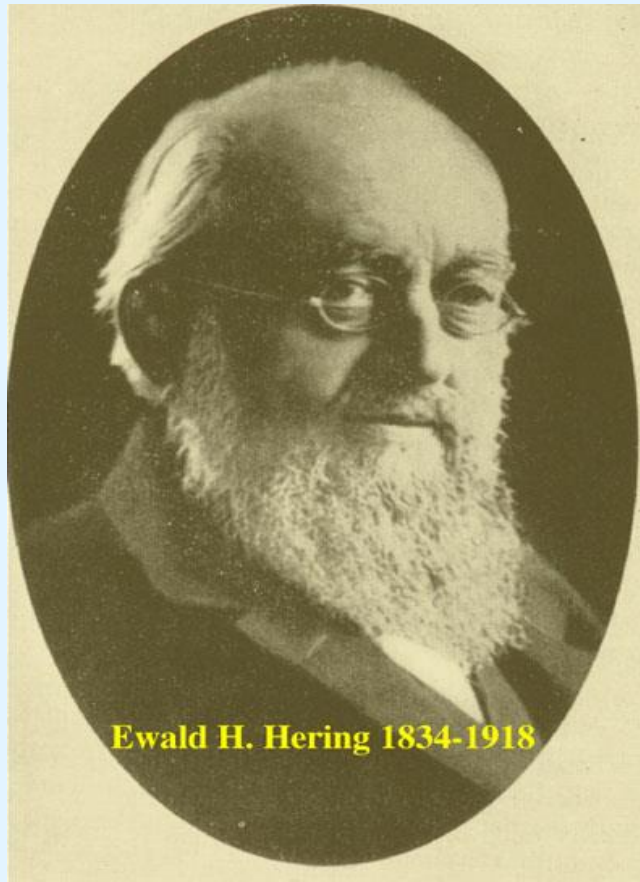
Nemcsics Antal, a COLOROID kifejlesztője. BME Építőmérnöki Kar Rajzi Tanszék nyugalmazott vezetője, az AIC Magyar Nemzeti Bizottság elnöke, a színharmónia rendszer megfogalmazója



Leonardo

(1452 Vinci

1519 Cloux, Amboise)



Karl Ewald Konstantin Hering
(1834 Alt-Gersdorf
1918 Leipzig)



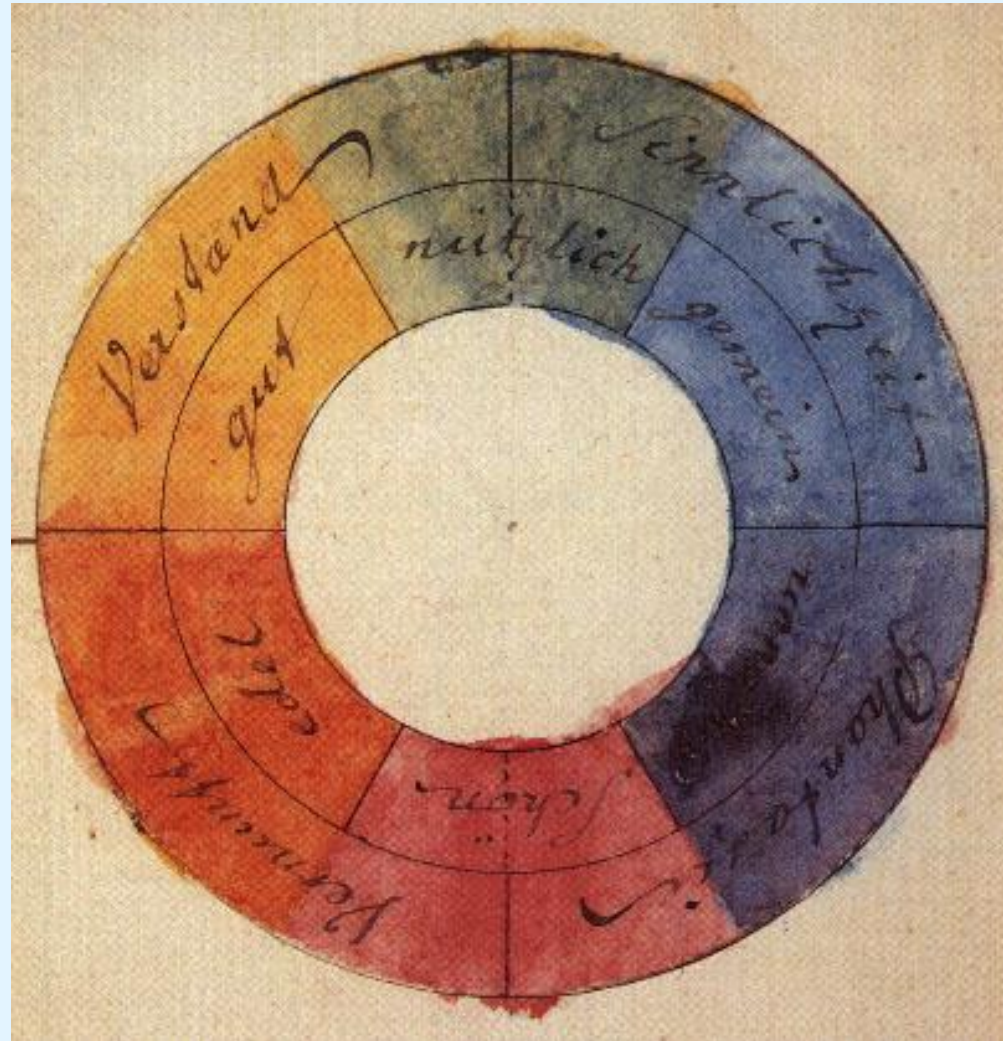
Hermann Günther Grassman

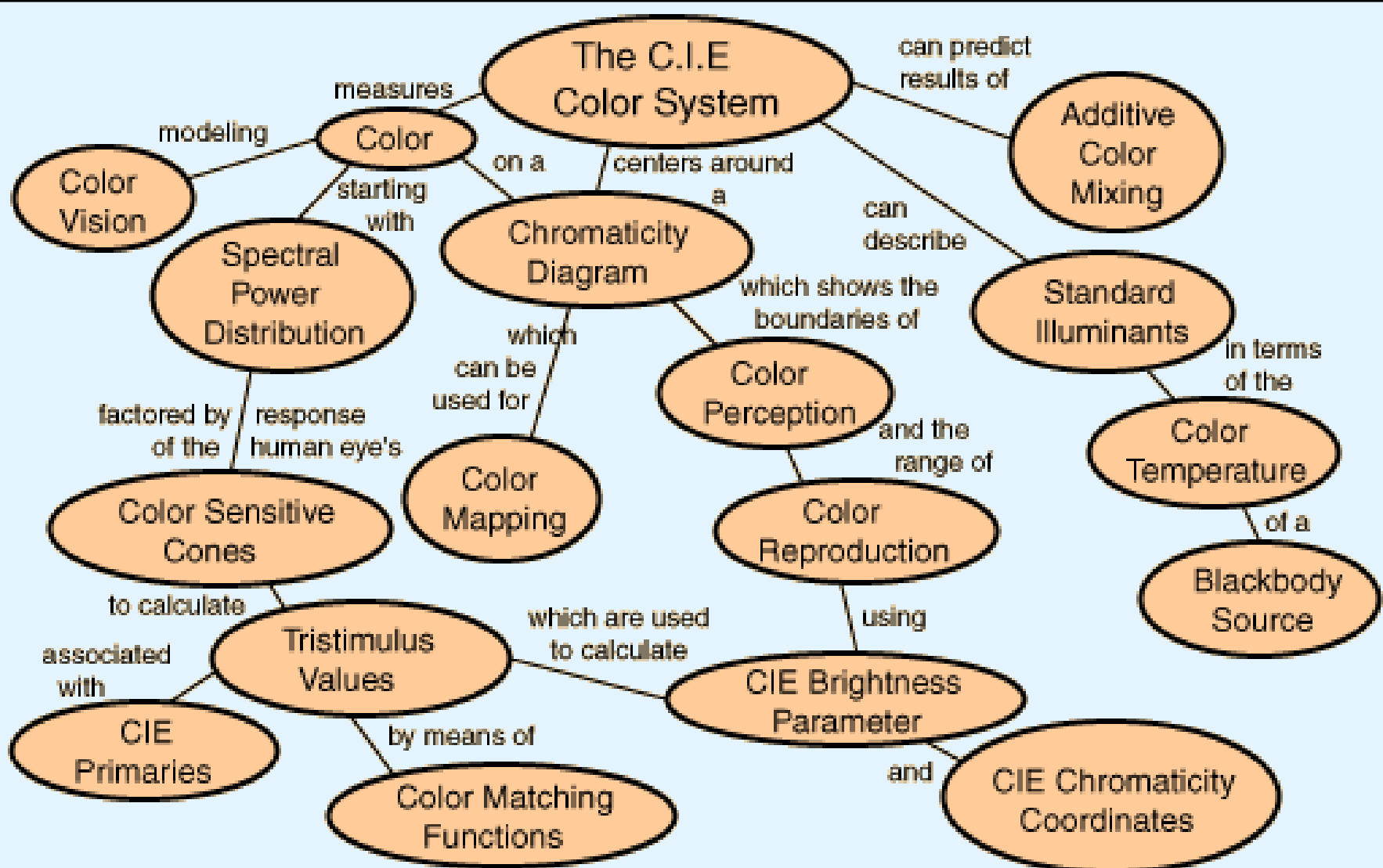
1809 Stettin, Prussia (Szczecin)

1877 Stettin

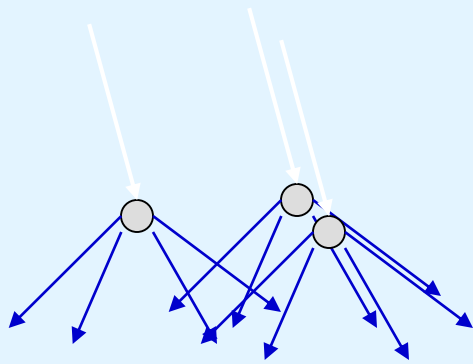
Korai színrendszerek

- Goethe
színköre,
1810





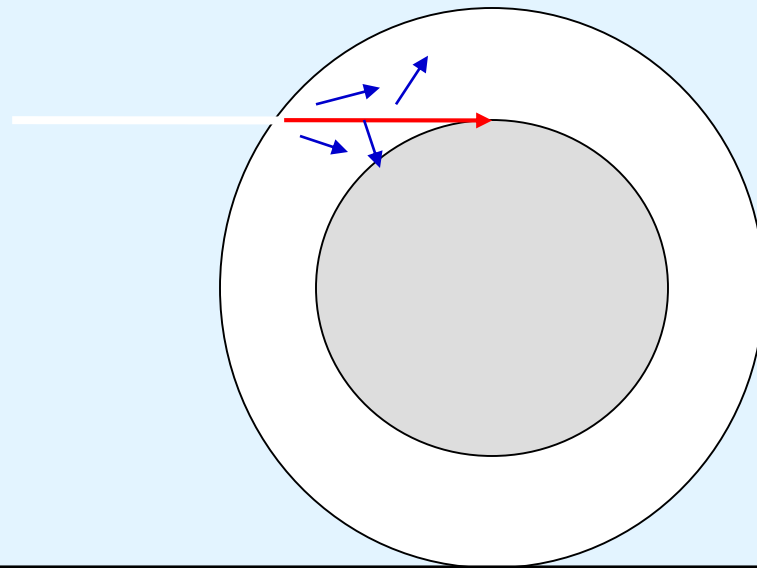
Összefüggés a szintanban értelmezett fogalmak között



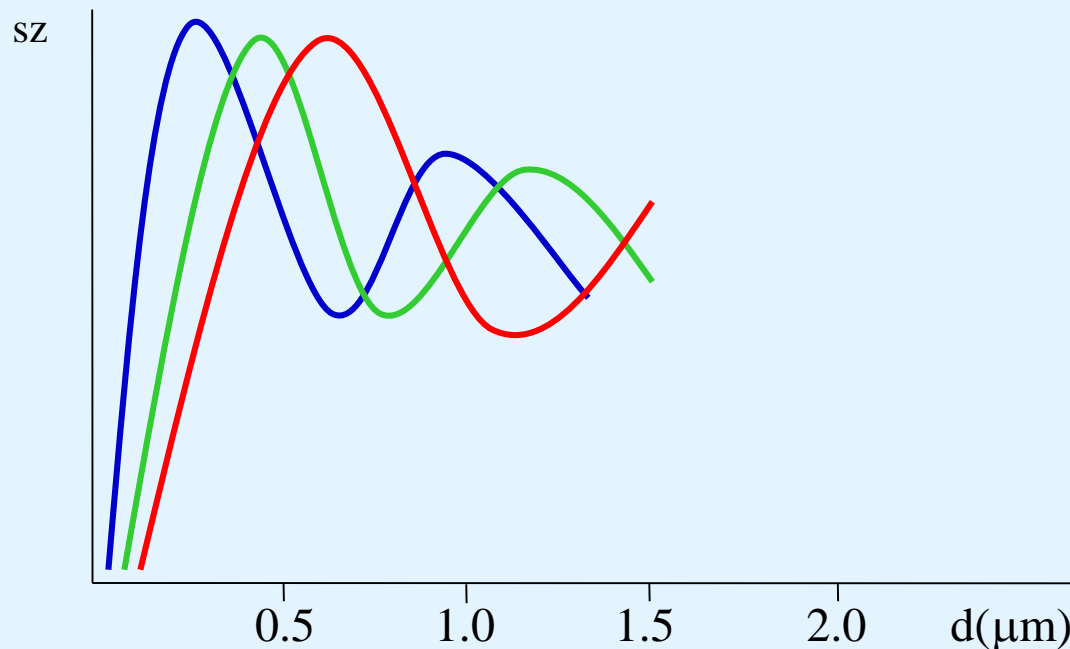
Rayleigh-féle szórás: a szórás mértéke fordítottan arányos a hullámhossz negyedik hatványával ($\sim \lambda^{-4}$), ha szóró részecske mérete jóval kisebb mint a hullámhossz ($d \ll \lambda$).

Következmény: a) a nappali égbolt színe kék

b) napkeltekor és naplementekor vörös az ég alja.



Mie-féle szórás ($d > \lambda$) **Gustav Adolf Feodor Wilhelm Ludwig Mie**



A szórás mértéke nem csak a hullámhossztól, hanem a szóró részecske méretétől is függ.

Felhők fehér színének magyarázata:

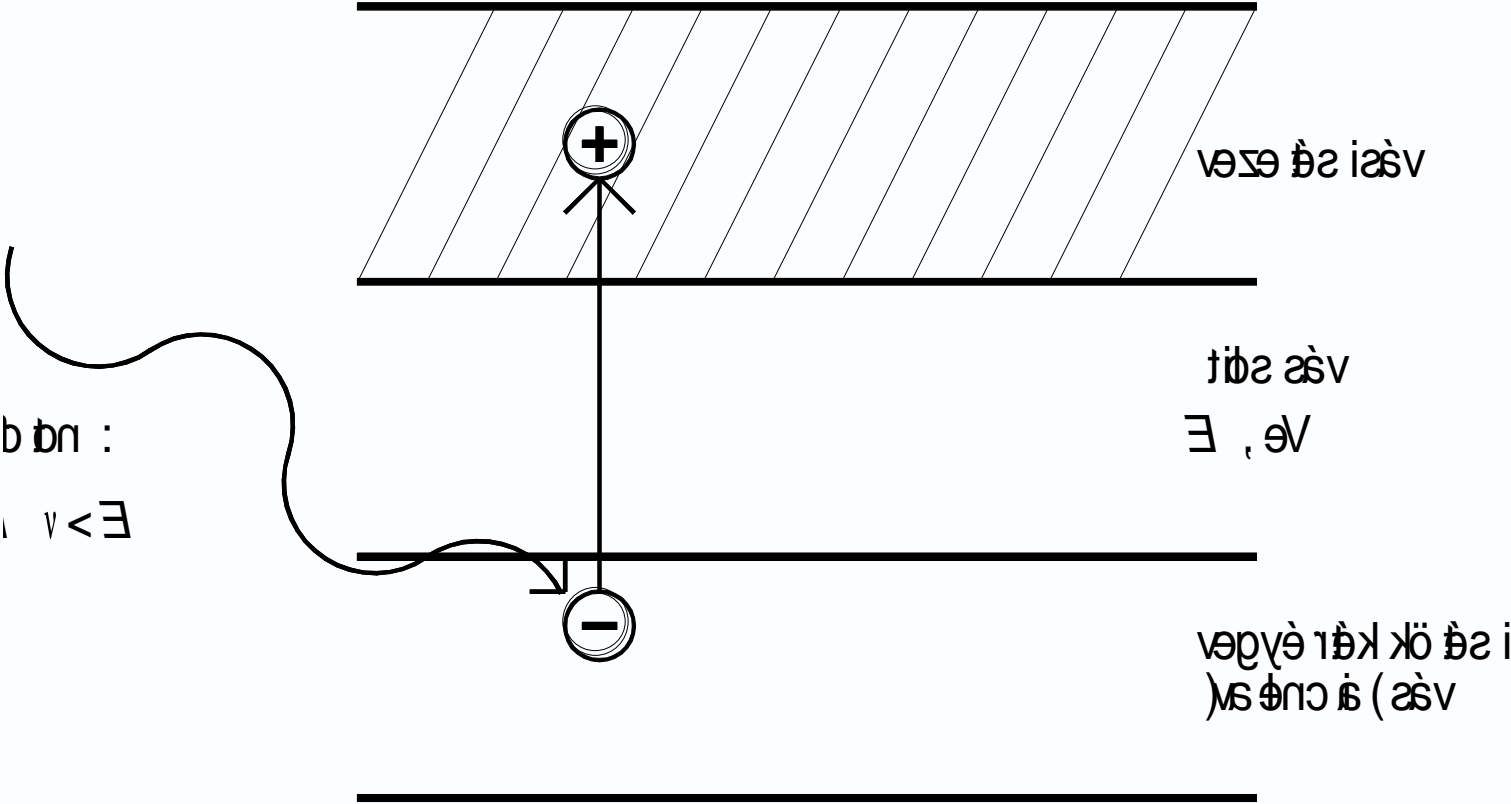
a felhőket alkotó nagyobb méretű részecskék ($d > 10 \mu\text{m}$) minden hullámhosszon erősen szórnak

Fényérzékelők

- Belső fényelektromos hatás: fotovezetők (Indium-antimonid, InSb, CdS, CdSe)
- Záróréteges hatás: fényelemek (Si, Ge, GaAsP), fotodiódák, fototranzisztorok (Si), lavina fotodióda, CCD (Charge Coupled Device), CMOS (Charge Coupled Metal Oxide Semiconductor), Se, foto-FET
- Külső fényelektromos hatás: fotokatód (AgOCs, CsNaK), fotocella, fotoelektron-sokszorozó (vákuumcsövek)
- Termikus detektorok (Seebeck-effektus), piroelektromos cella (polivinil-fluorid)

Belső fényelektromos hatás

Photoconductive cell

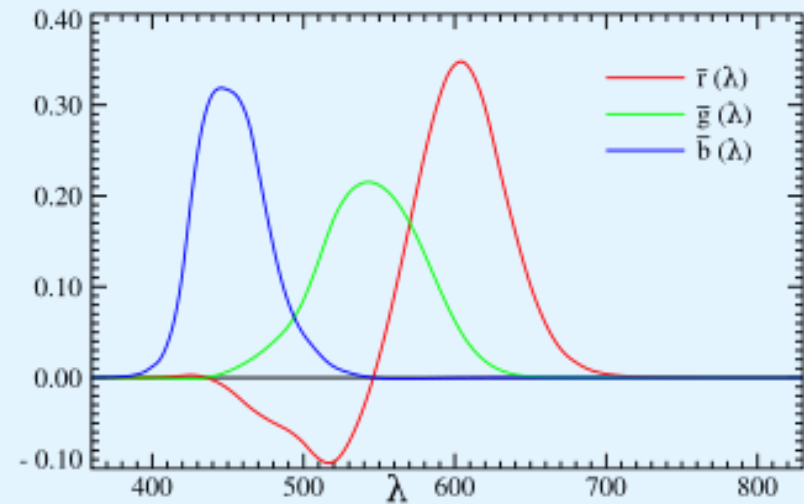
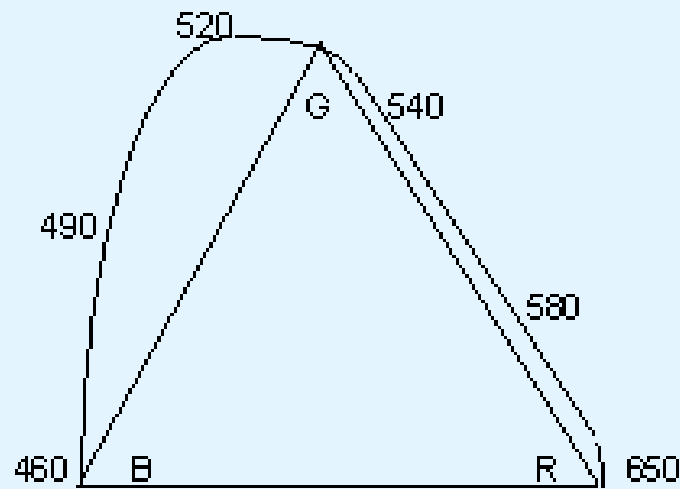


CIE standard illuminant A

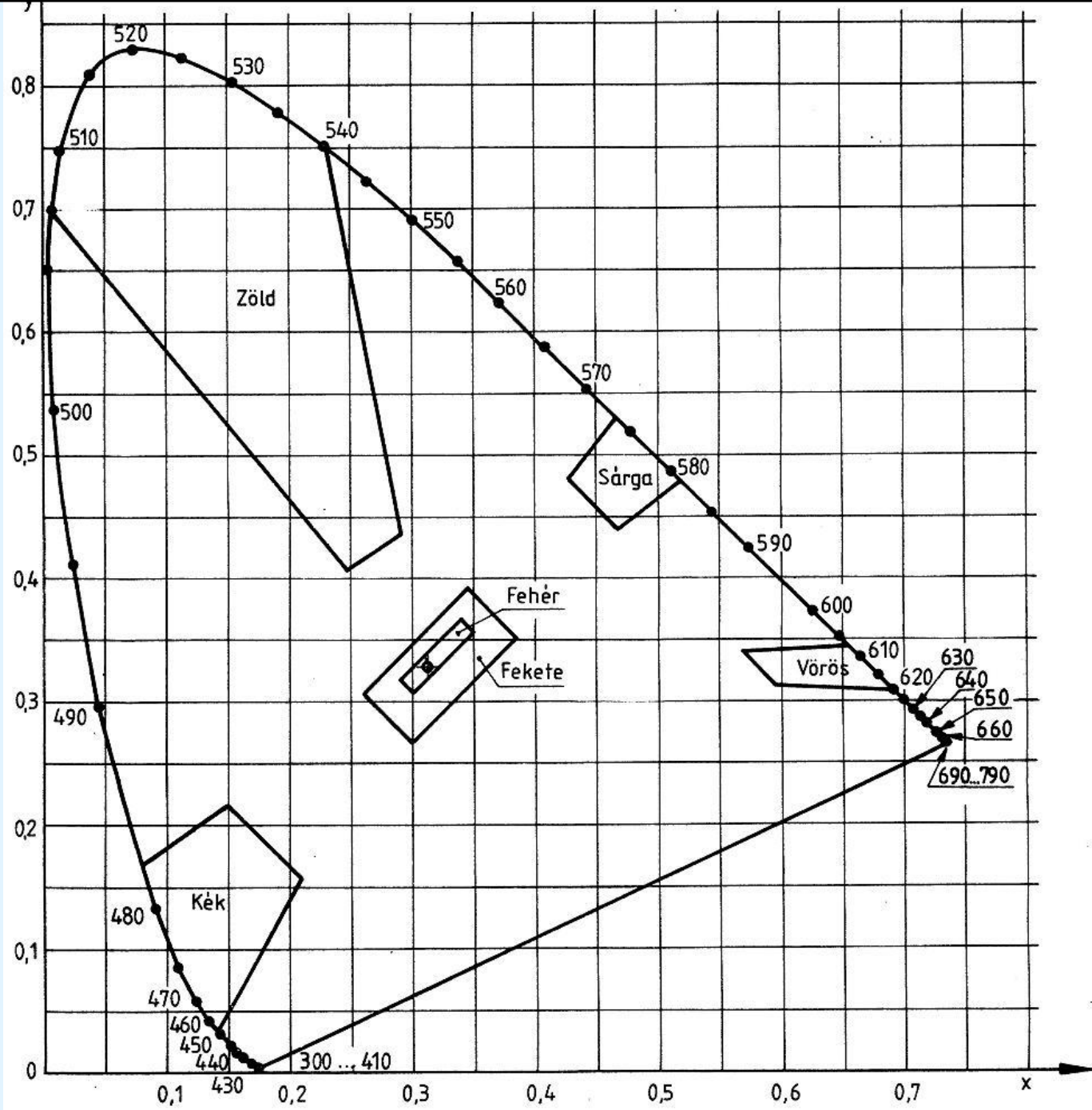
The relative spectral power distribution $S_A(\lambda)$ is defined by the equation

$$S_A(\lambda) = 100 \left(\frac{560}{\lambda} \right)^5 \cdot \frac{\exp \frac{1,435 \cdot 10^7}{2848 \cdot 560} - 1}{\exp \frac{1,435 \cdot 10^7}{2848 \cdot \lambda} - 1}$$

where λ is the vacuum wavelength in nanometres and the numerical values in the two exponential terms are definitive constants originating from the first definition of Illuminant A in 1931. This spectral power distribution is normalized to the value 100 (exactly) at the vacuum wavelength 560 nm (exactly).

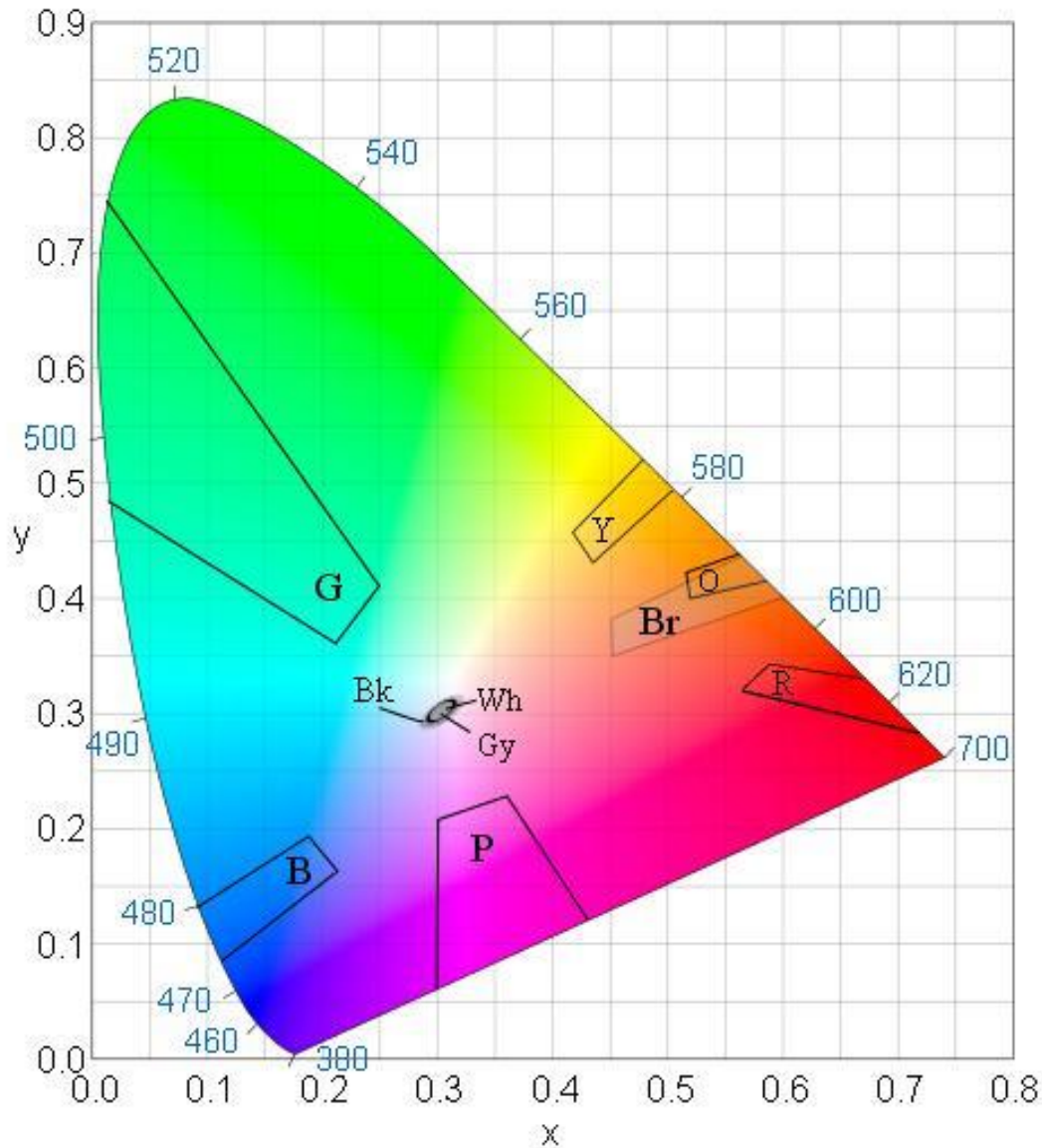


A CIE 1931 RGB származtatása

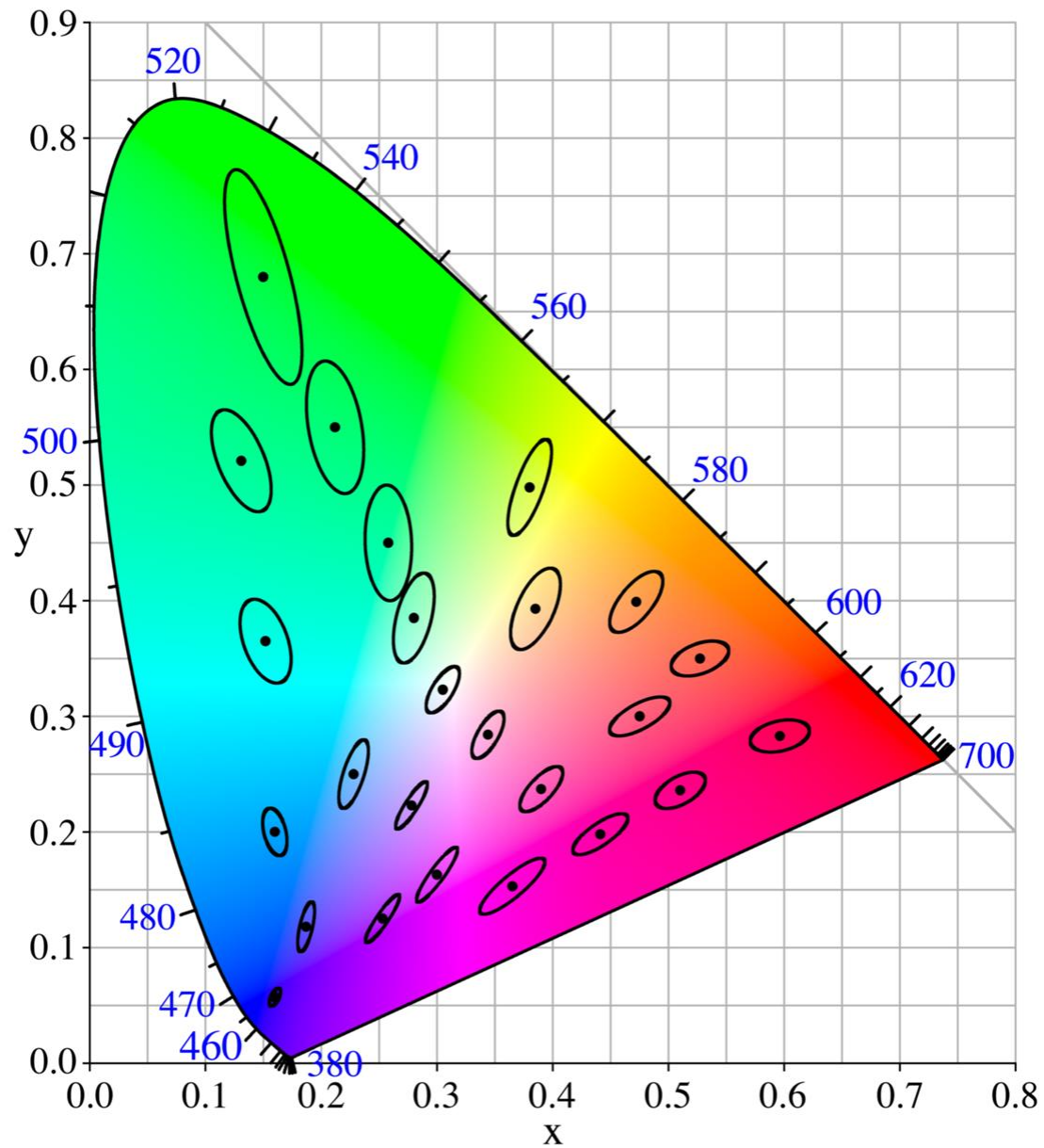


Amerikában a bíbor szín tőrésmezejét is szabványosították

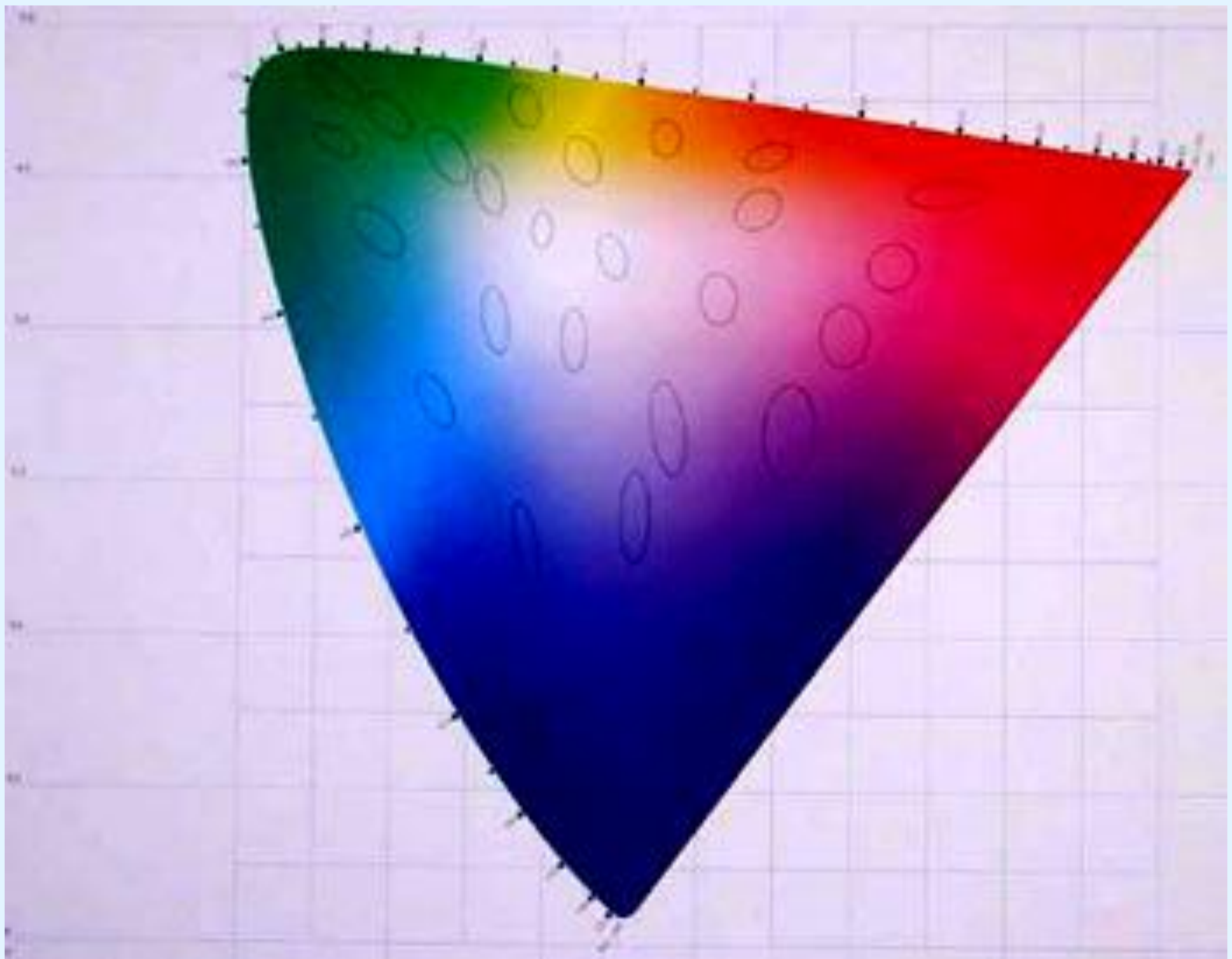
Green
Black
White
Grey
Blue
Purple



Yellow
Orange
Brown
Red



MacAdam tolerancia ellipszisek



Tolerancia ellipszisek a CIELUV rendszerben

CIE 1976 L*a*b*

- Alapvető színkülönbségi képlet

$$\Delta E = \sqrt{(\Delta L)^2 + (\Delta a^*)^2 + (\Delta b^*)^2}$$

CIE 1976 L*u*v*

- Alapvető színekülönbségi képlet
 u_n és v_n a szabványos megvilágításra vonatkoznak (normal illuminant)

$$u' = \frac{4X}{X + 15Y + 3Z}$$

$$v' = \frac{9Y}{X + 15Y + 3Z}$$

$$u^* = 13L^*(u' - u_n')$$

$$v^* = 13L^*(v' - v_n')$$

$$\Delta E = \sqrt{(\Delta L)^2 + (\Delta u^*)^2 + (\Delta v^*)^2}$$

CIE 1976 L*u*v*

Króma

$$C^* = \sqrt{(u^*)^2 + (v^*)^2}$$

Színezeti szög

$$h_{uv} = \arctan \frac{v^*}{u^*}$$

CIE színkülönbségi képlet

$$\Delta E_{\infty} = \left[\left(\frac{\Delta L'}{k_L S_L} \right)^2 + \left(\frac{\Delta C'}{k_C S_C} \right)^2 + \left(\frac{\Delta H'}{k_H S_H} \right)^2 + \left(R_T \left(\frac{\Delta C'}{k_C S_C} \right) \left(\frac{\Delta H'}{k_H S_H} \right) \right) \right]^{1/2}$$

$$L' = L^*$$

$$a' = a^*(1+G)$$

$$b' = b^*$$

$$G = 0,5 \left(1 - \sqrt{\frac{\overline{C}_{ab}^{*T}}{\overline{C}_{ab}^{*T} + 25^T}} \right)$$

CIE színkülönbségi képlet

$$S_L = 1 + \frac{0,015 (\bar{L}' - 50)^2}{\sqrt{20 + (\bar{L}' - 50)^2}}$$

$$S_C = 1 + 0,045 \bar{C}'$$

$$S_H = 1 + 0,015 \bar{C}' T$$

$$T = 1 - 0,17 \cos(\bar{h}' - 30) + 0,24 \cos(2\bar{h}') + 0,32 \cos(3\bar{h}' + 6) - 0,20 \cos(4\bar{h}' - 63)$$

CIE Whiteness Index

$$W = Y + 800(x_n - x) + 1700(y_n - y)$$

$$W_{10} = Y_{10} + 800(x_{n,10} - x_{10}) + 1700(y_{n,10} - y_{10})$$

$$T_w = 1000(x_n - x) - 650(y_n - y)$$

$$T_{w,10} = 900(x_{n,10} - x_{10}) - 650(y_{n,10} - y_{10})$$

where Y is the Y -tristimulus value of the sample, x and y are the x , y chromaticity coordinates of the sample, and x_n , y_n are the chromaticity coordinates of the perfect diffuser, all for the CIE 1931 standard colorimetric observer; Y_{10} , x_{10} , y_{10} , $x_{n,10}$ and $y_{n,10}$ are similar values for the CIE 1964 standard colorimetric observer.

CIE Whiteness Index

$$W_{\text{CIE-L}^*\text{a}^*\text{b}^*} =$$

$$2.41L^* - 4.45b^*[1 - 0.009(L^* - 96)] - 141.4$$

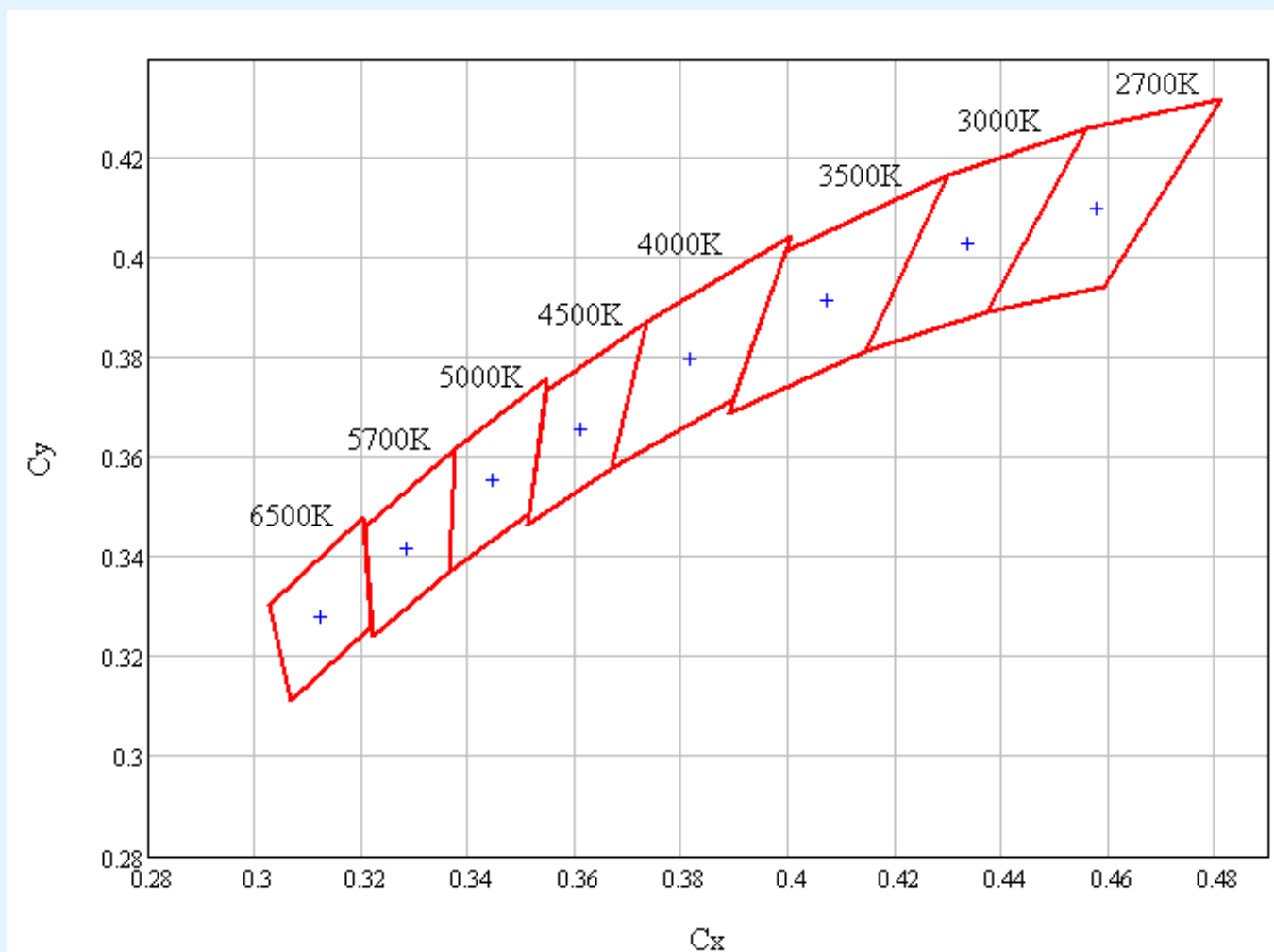
Whiteness Index

- ASTM American Society for Testing and Materials
 - o Color and Appearance E12

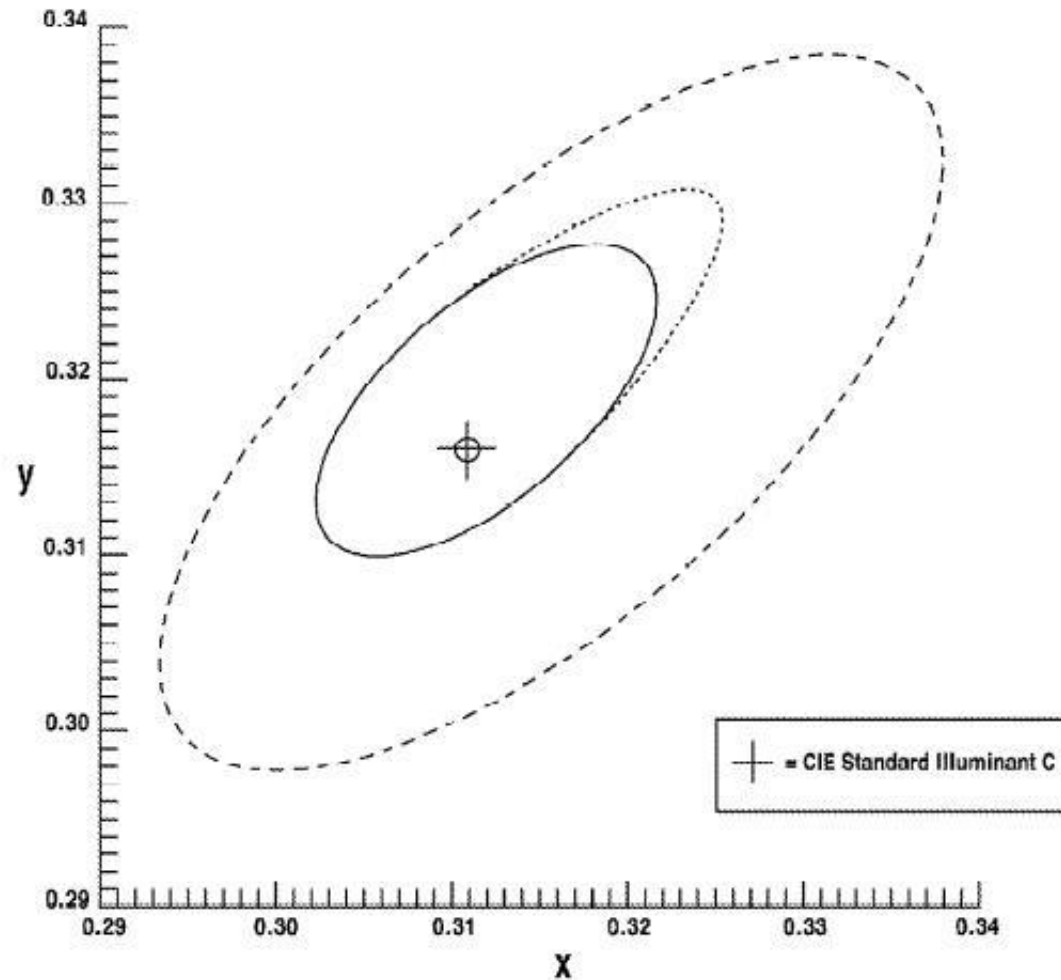
Whiteness Indices

- ASTM E313-98 Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates
- $WI = 3,388Z - 3Y$
- $W_{\text{Taube}} = G - 4(G - B)$ BASF
- $WI_{\text{Leukometer}} = 2R_{459} - R_{614}$ Carl Zeiss, Jena

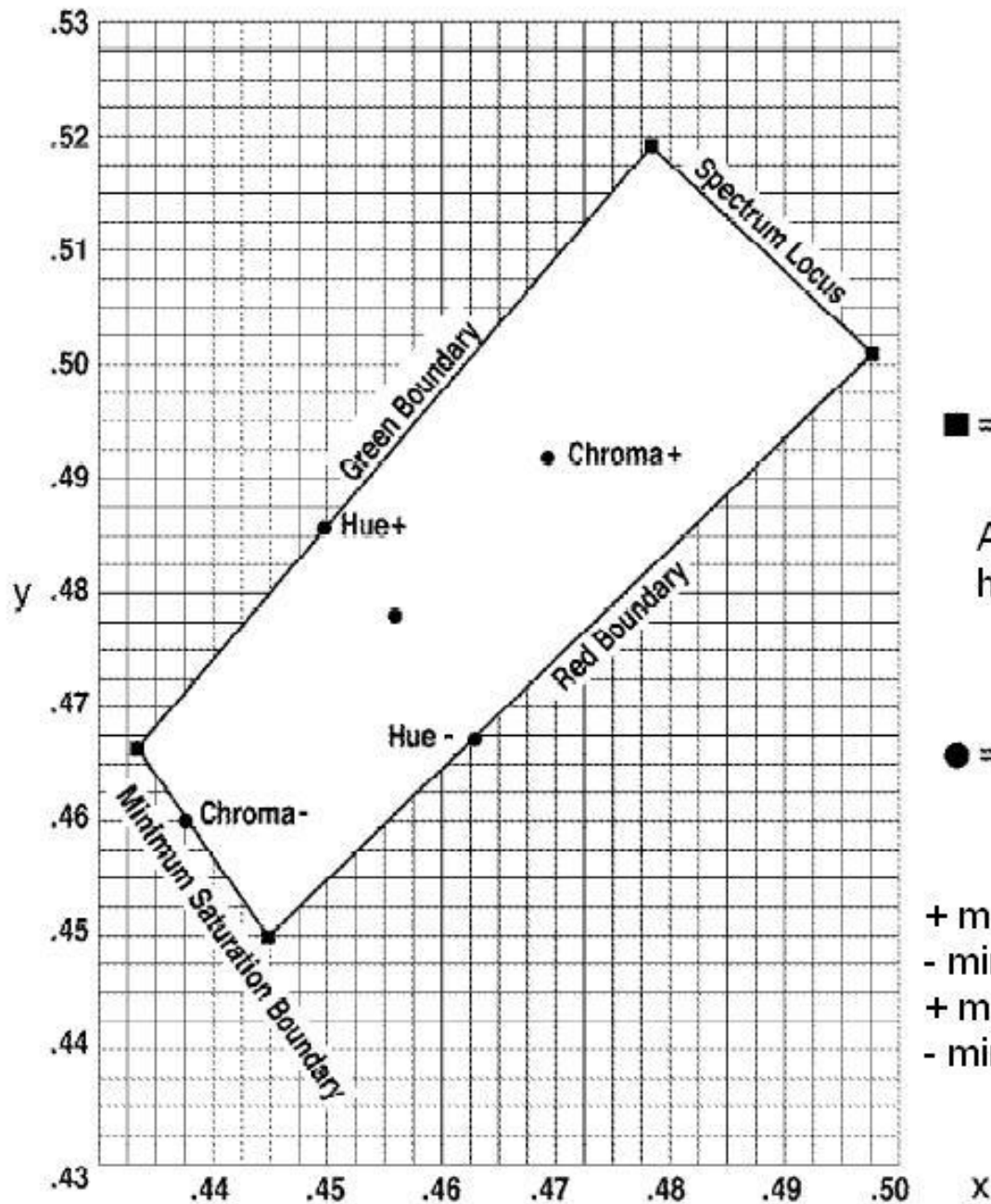
Tűrésmező a fehér fény meghatározására ANSI szerint



Fehér, szürke és fekete tőrésmező ANSI Z5351 szerint



| Legend | Color | Munsell Value | Munsell Chroma Tolerance |
|--------|-------|---------------|--------------------------|
| | White | N 9 | /0.5 to /1.0 |
| ———— | Grey | N 5 | /0.5 |
| ----- | Black | N 1.5 | /0.5 |



This diagram shows the relationship between the permissible color region for Safety Yellow as shown in Figure 1 tolerance limits for Safety Yellow described in the CIE data found in Table 1.

■ = Corner Points of Acceptable Color Tolerance Region

Az elfogadható színek határpontjai

● = Color Tolerance Chart Colors

Szintani határok

+ maximális hue (színezet)

- minimális hue

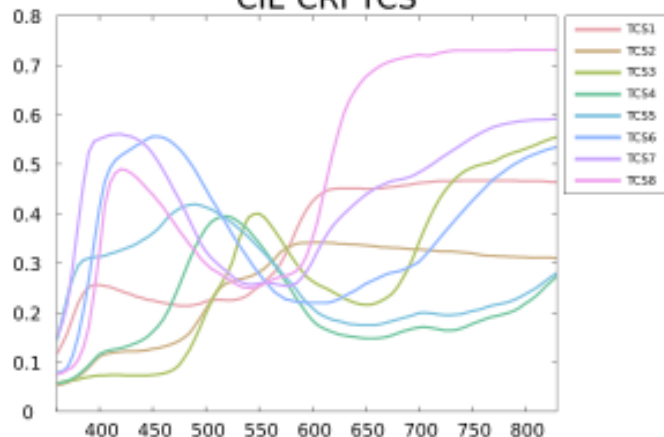
+ maximális chroma (színtelítettség)

- minimális chroma

Test color samples

As specified in (CIE 1995), the original test color samples (TCS) are taken from an early edition of the Munsell Atlas. The first eight samples, a subset of the eighteen proposed in (Nickerson 1960), are relatively low saturated colors and are evenly distributed over the complete range of hues.^[8] These eight samples are employed to calculate the general color rendering index R_a . The last seven samples provide supplementary information about the color rendering properties of the light source; the first four for high saturation, and the last three as representatives of well-known objects. The reflectance spectra of these samples may be found in (CIE 2004),^[9] and their approximate Munsell notations are listed aside.^[10]

CIE CRI TCS

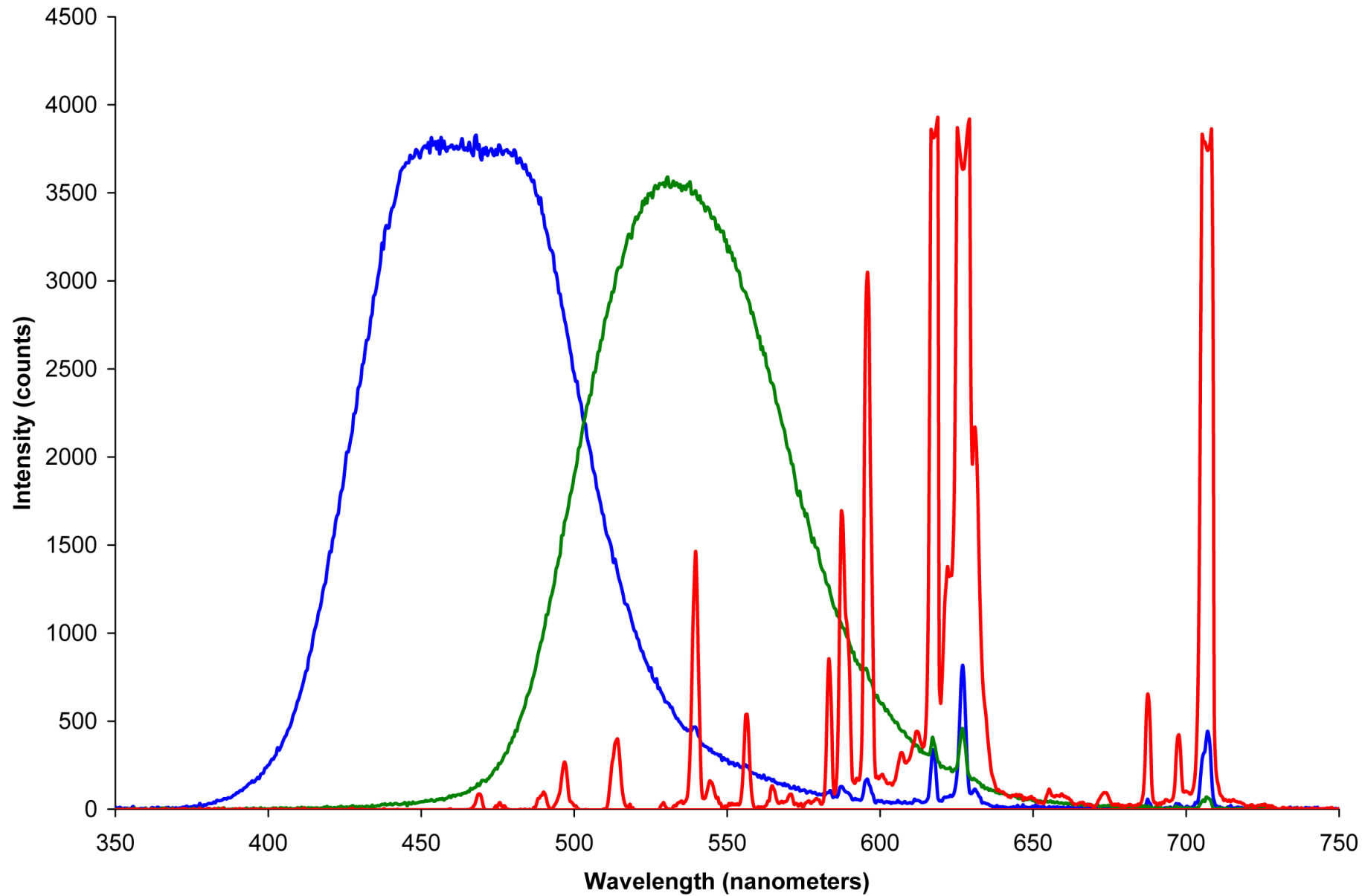


| Name | Appr. Munsell | Appearance under daylight | Swatch |
|-------|---------------|-----------------------------|--------|
| TCS01 | 7,5 R 6/4 | Light greyish red | |
| TCS02 | 5 Y 6/4 | Dark greyish yellow | |
| TCS03 | 5 GY 6/8 | Strong yellow green | |
| TCS04 | 2,5 G 6/6 | Moderate yellowish green | |
| TCS05 | 10 BG 6/4 | Light bluish green | |
| TCS06 | 5 PB 6/8 | Light blue | |
| TCS07 | 2,5 P 6/8 | Light violet | |
| TCS08 | 10 P 6/8 | Light reddish purple | |
| TCS09 | 4,5 R 4/13 | Strong red | |
| TCS10 | 5 Y 8/10 | Strong yellow | |
| TCS11 | 4,5 G 5/8 | Strong green | |
| TCS12 | 3 PB 3/11 | Strong blue | |
| TCS13 | 5 YR 8/4 | Light yellowish pink (skin) | |
| TCS14 | 5 GY 4/4 | Moderate olive green (leaf) | |
| TCS15 | 1 YR 6/4 | Asian skin | |

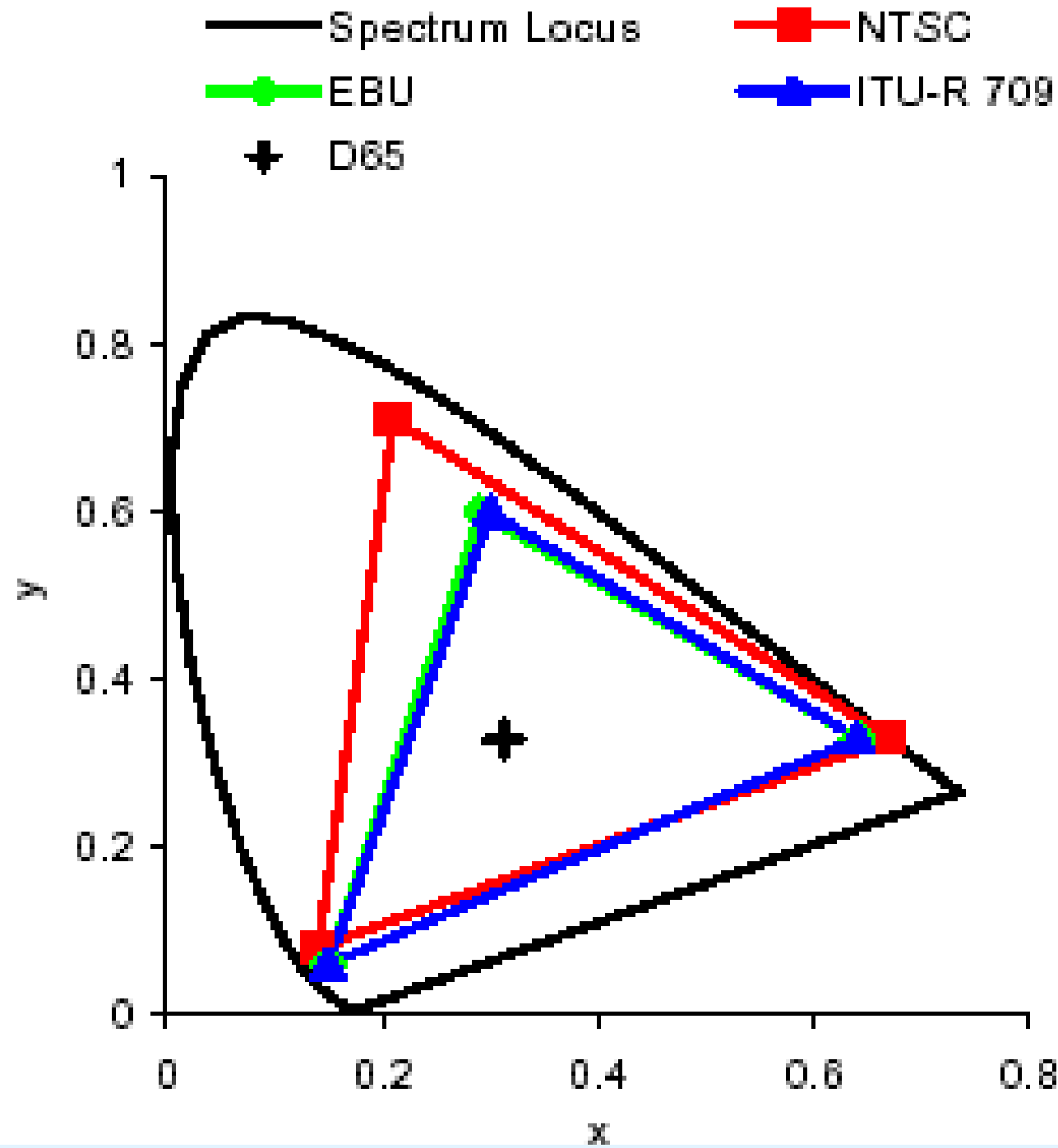
Fényforrás színvisszadásának mérése

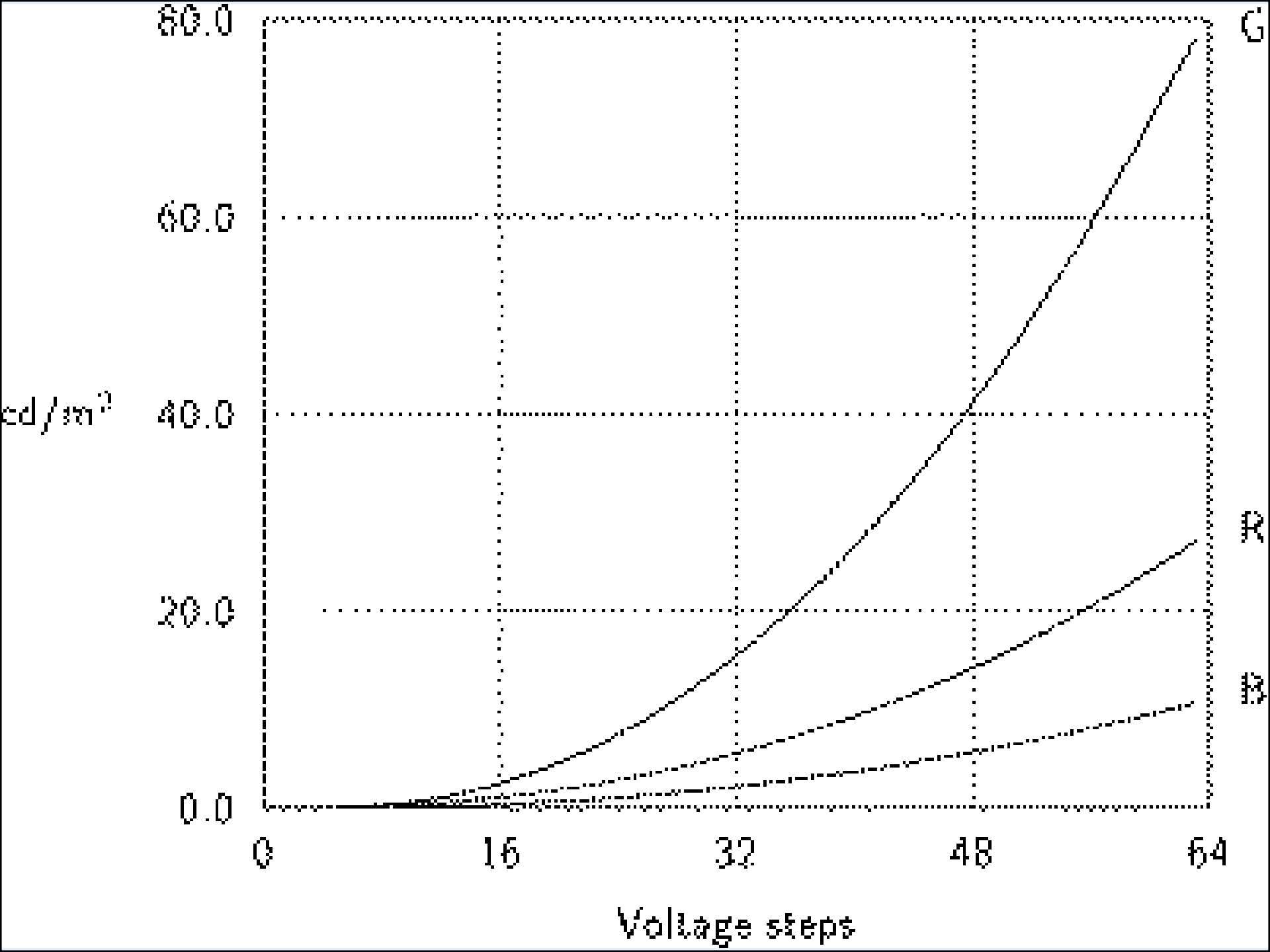
Table 1: Attributes of standard RGB color spaces

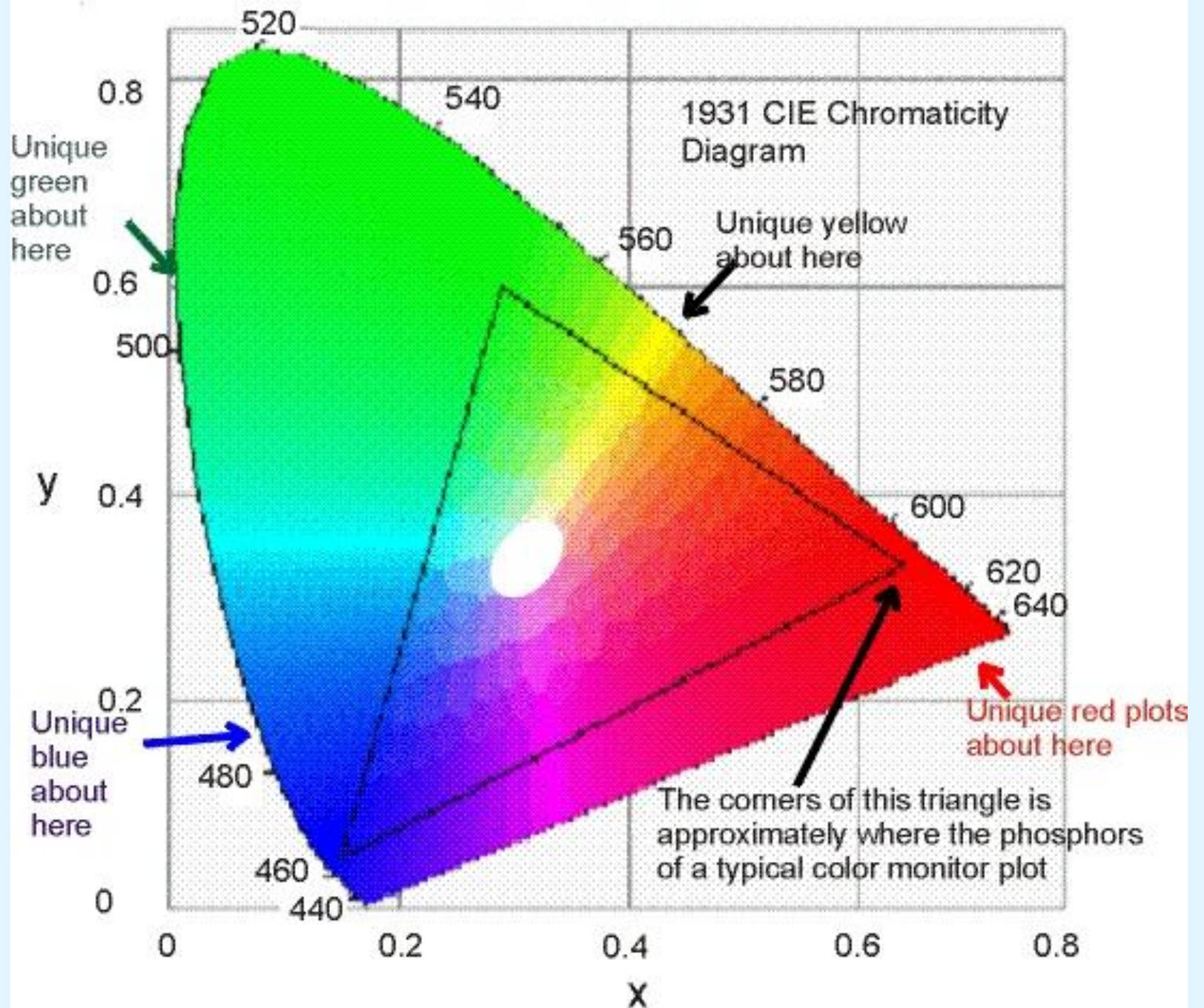
| Color Space | Type | Encoding | Gamut | White Point | Primaries | | | Specified Dynamic Range and Viewing Conditions |
|--------------------|------------|---------------------------------------|--------------------|-------------|-----------|--------|--------|---|
| | | | | | x | y | | |
| ISO RGB | Unrendered | 8-bit nonlinear | Limited | floating | floating | | | No |
| Extended ISO RGB | Unrendered | 10- to 16-bit nonlinear | Unlimited (signed) | floating | floating | | | No |
| sRGB | Rendered | 8-bit nonlinear | CRT | D65 | R | 0.64 | 0.33 | Yes; reference viewing environment defined, with D50 as ambient white point |
| | | | | | G | 0.30 | 0.60 | |
| | | | | | B | 0.15 | 0.06 | |
| ROMM RGB | Rendered | 8-bit nonlinear, 12-, 16-bit optional | Wide | D50 | R | 0.7347 | 0.2653 | Yes; reproduction viewing environment defined |
| | | | | | G | 0.1596 | 0.8404 | |
| | | | | | B | 0.0366 | 0.0001 | |
| Adobe RGB 98 | Rendered | 8-bit nonlinear | Extended CRT | D65 | R | 0.64 | 0.34 | No |
| | | | | | G | 0.21 | 0.71 | |
| | | | | | B | 0.15 | 0.06 | |
| Apple RGB | Rendered | 8-bit nonlinear | CRT | D65 | R | 0.625 | 0.34 | No |
| | | | | | G | 0.28 | 0.595 | |
| | | | | | B | 0.155 | 0.070 | |
| NTSC RGB | Rendered | Nonlinear | CRT | Ill. C | R | 0.67 | 0.33 | partial gamma correction to compensate for destination viewing conditions |
| | | | | | G | 0.21 | 0.71 | |
| | | | | | B | 0.14 | 0.08 | |
| EBU RGB (CCIR 601) | Rendered | Nonlinear | CRT | D65 | R | 0.64 | 0.33 | No |
| | | | | | G | 0.29 | 0.60 | |
| | | | | | B | 0.15 | 0.06 | |
| ITU-R BT.709 | Rendered | Nonlinear | CRT | D65 | R | 0.64 | 0.33 | No |
| | | | | | G | 0.30 | 0.60 | |
| | | | | | B | 0.15 | 0.06 | |

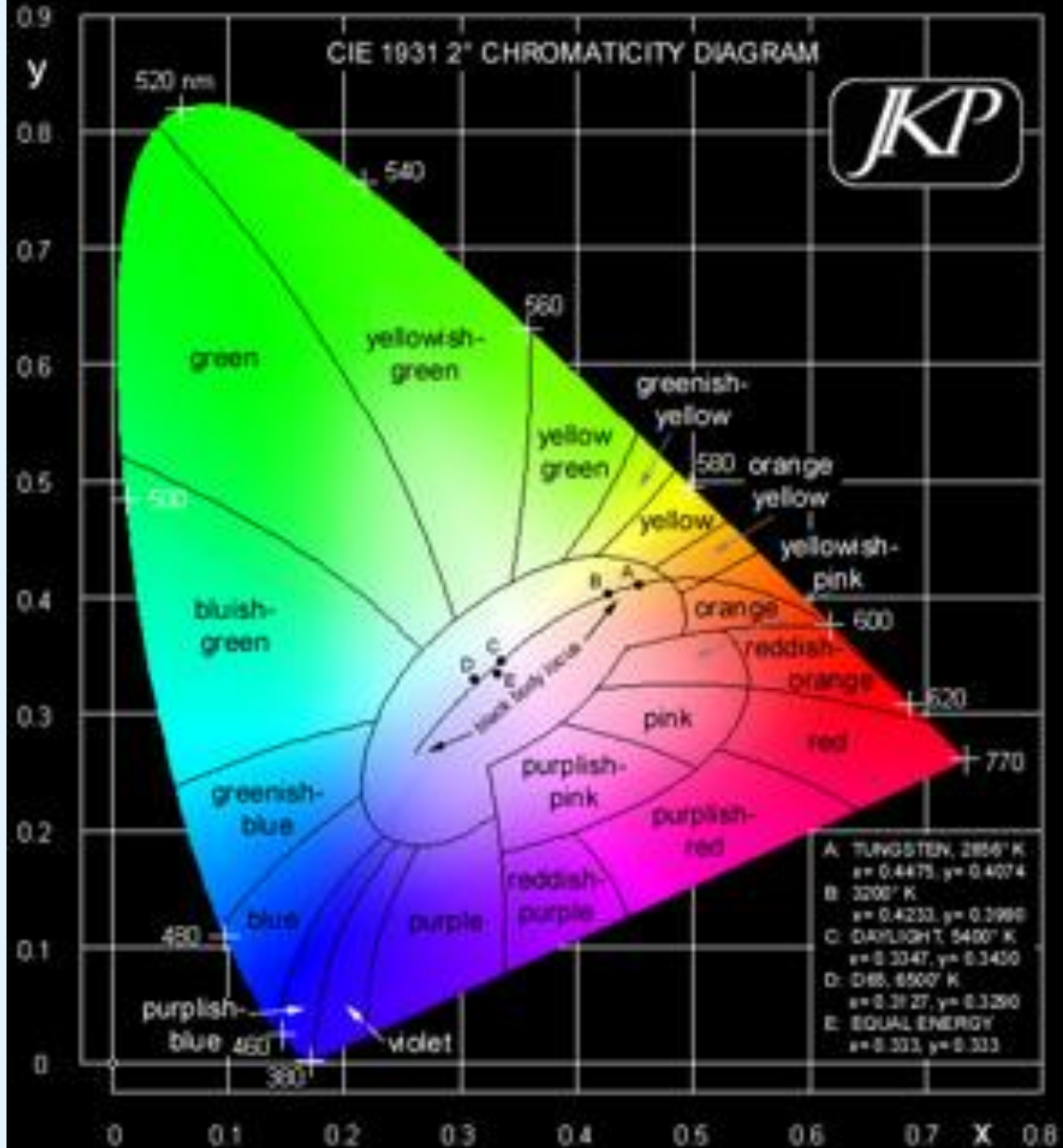


Színes foszforok spektruma



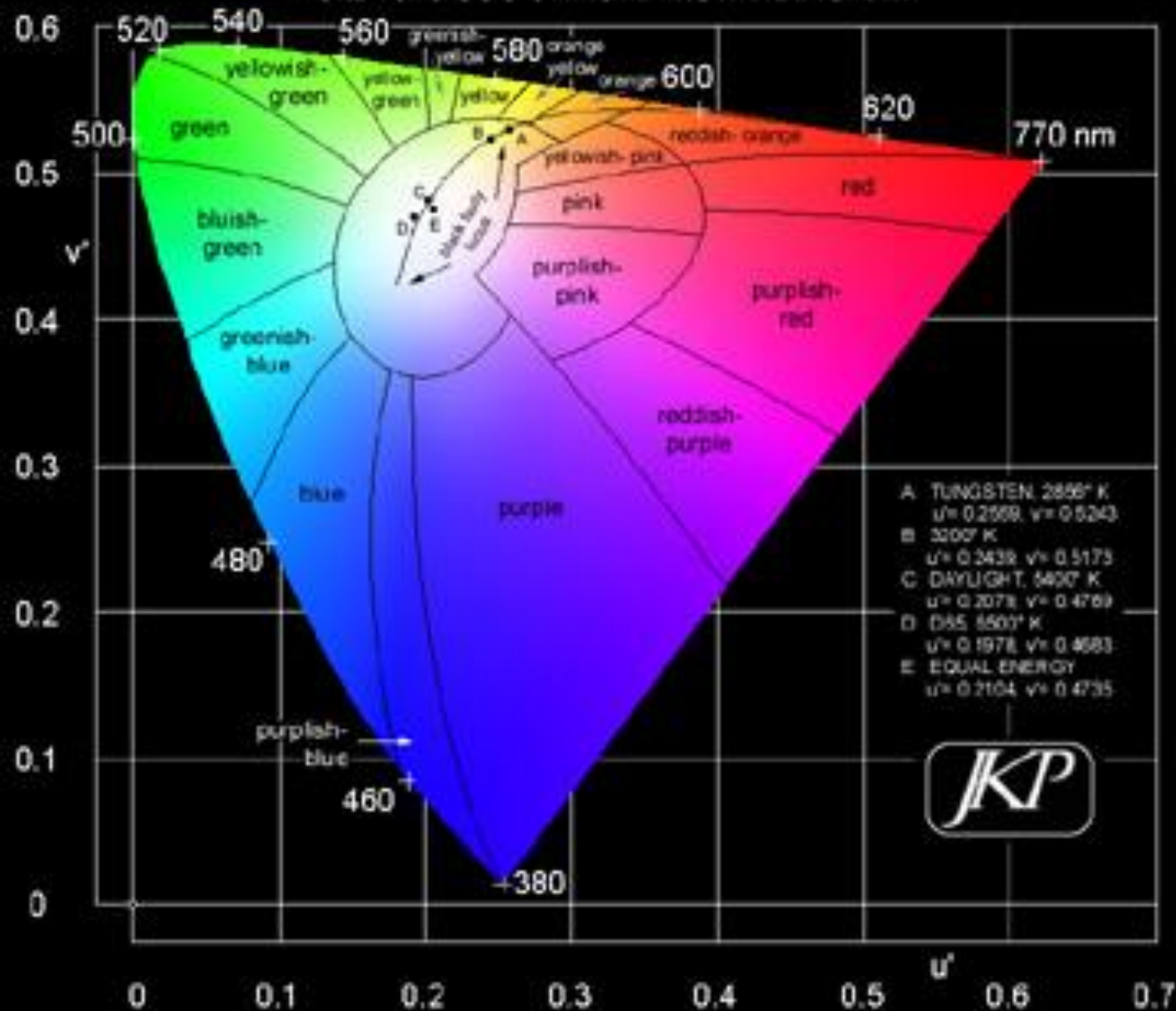






| | |
|----|--------------------------|
| A: | TUNGSTEN, 2856° K |
| | $x = 0.4475, y = 0.4074$ |
| B: | 3200° K |
| | $x = 0.4233, y = 0.3996$ |
| C: | DAYLIGHT, 4800° K |
| | $x = 0.3347, y = 0.3450$ |
| D: | D65, 6500° K |
| | $x = 0.3127, y = 0.3290$ |
| E: | EQUAL ENERGY |
| | $x = 0.333, y = 0.333$ |

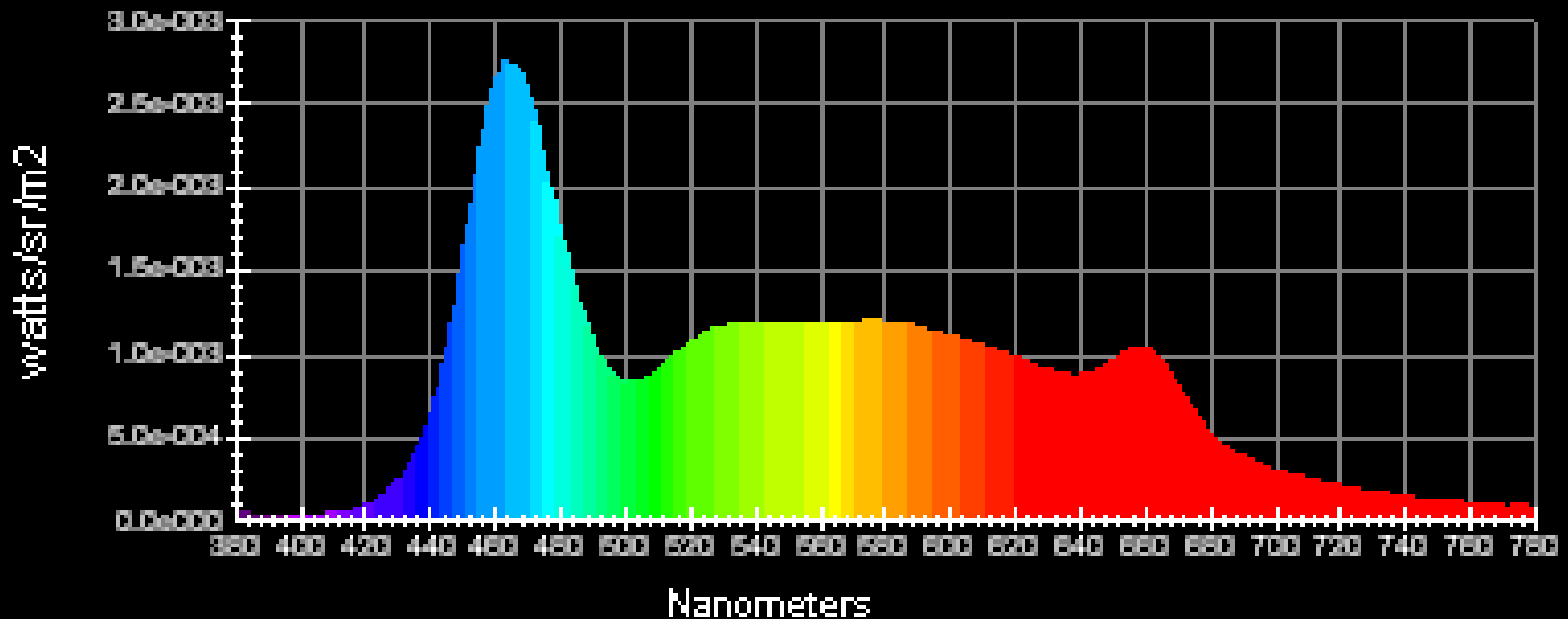
CIE 1976 UCS CHROMATICITY DIAGRAM



Fényforrás, a napfényhez hasonló sugárzáseloszlással

Spectral Radiance

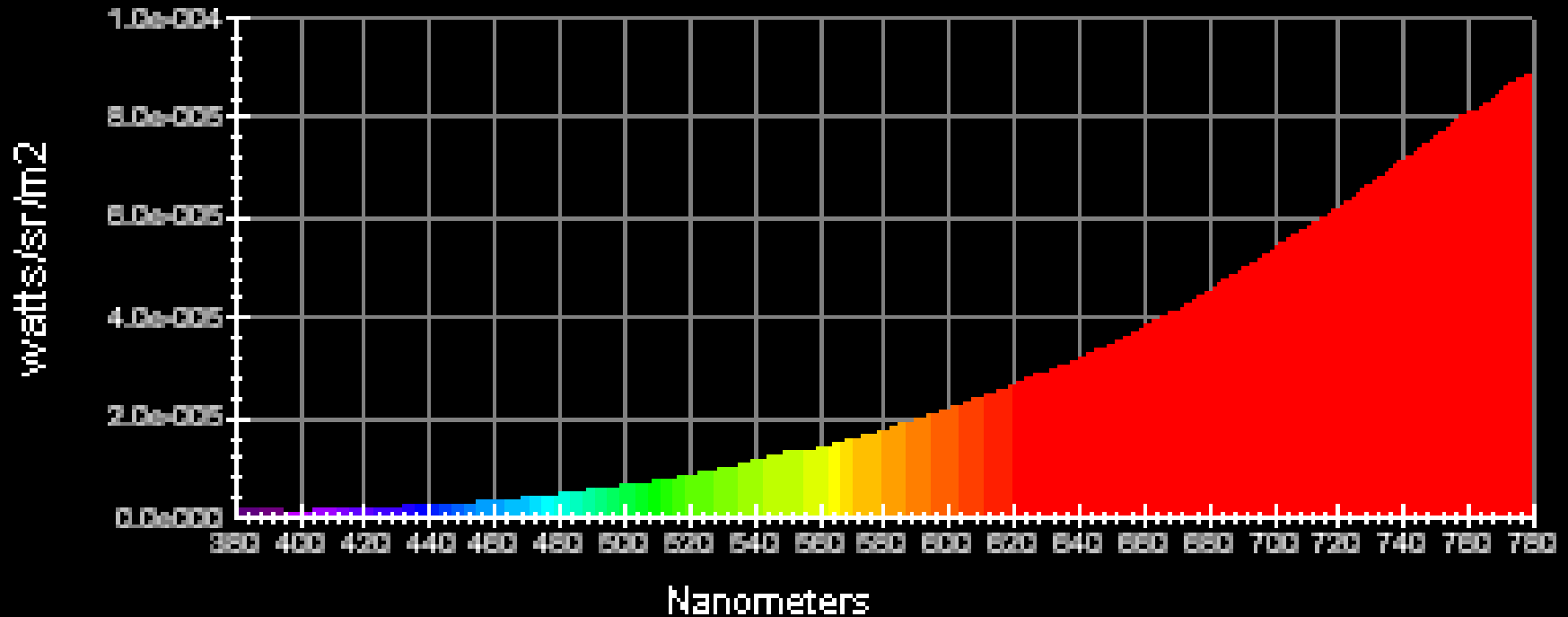
Peak @ 464 nm



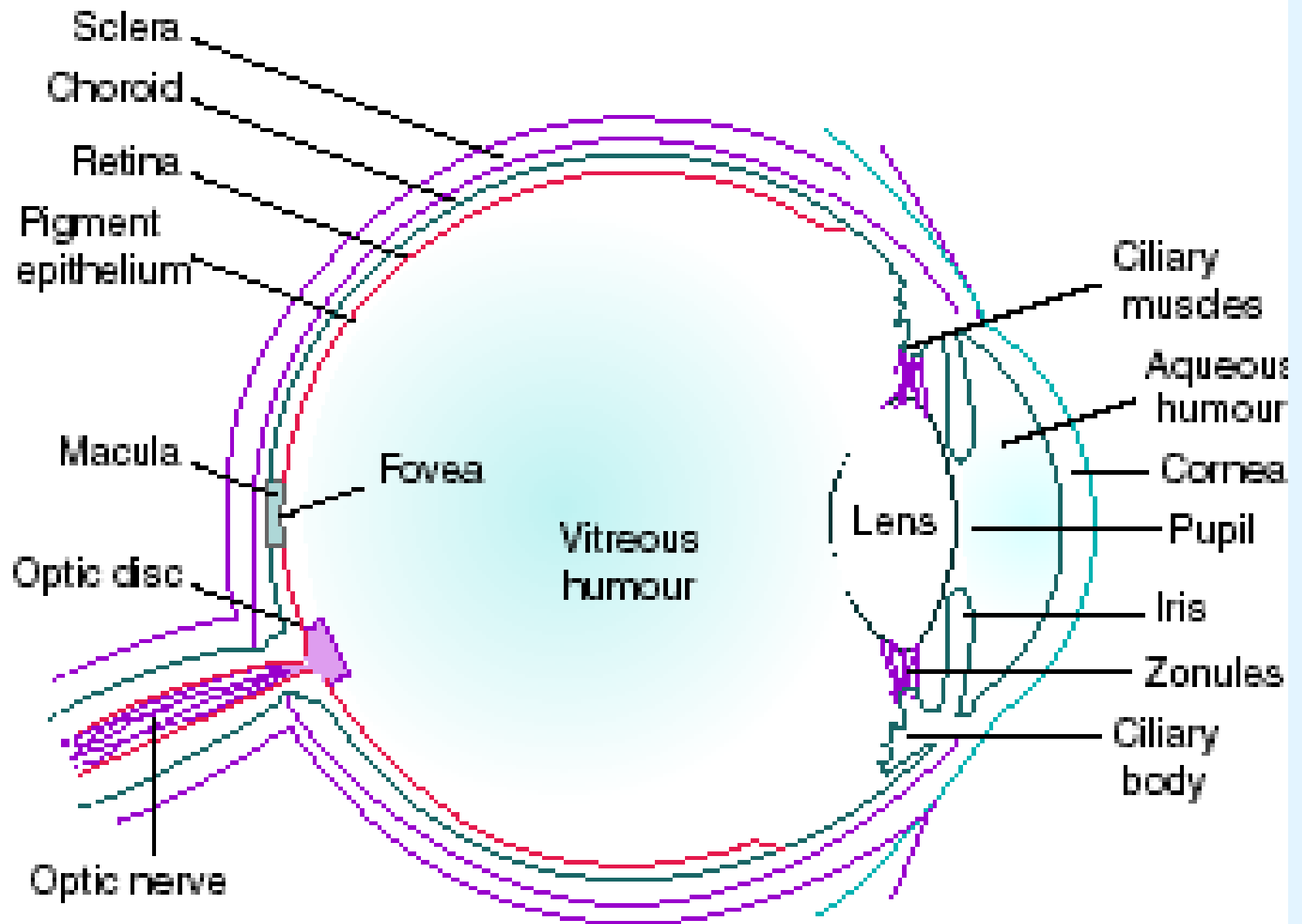
Termikus sugárzó, az A szabványos fényforráshoz hasonló eloszlással

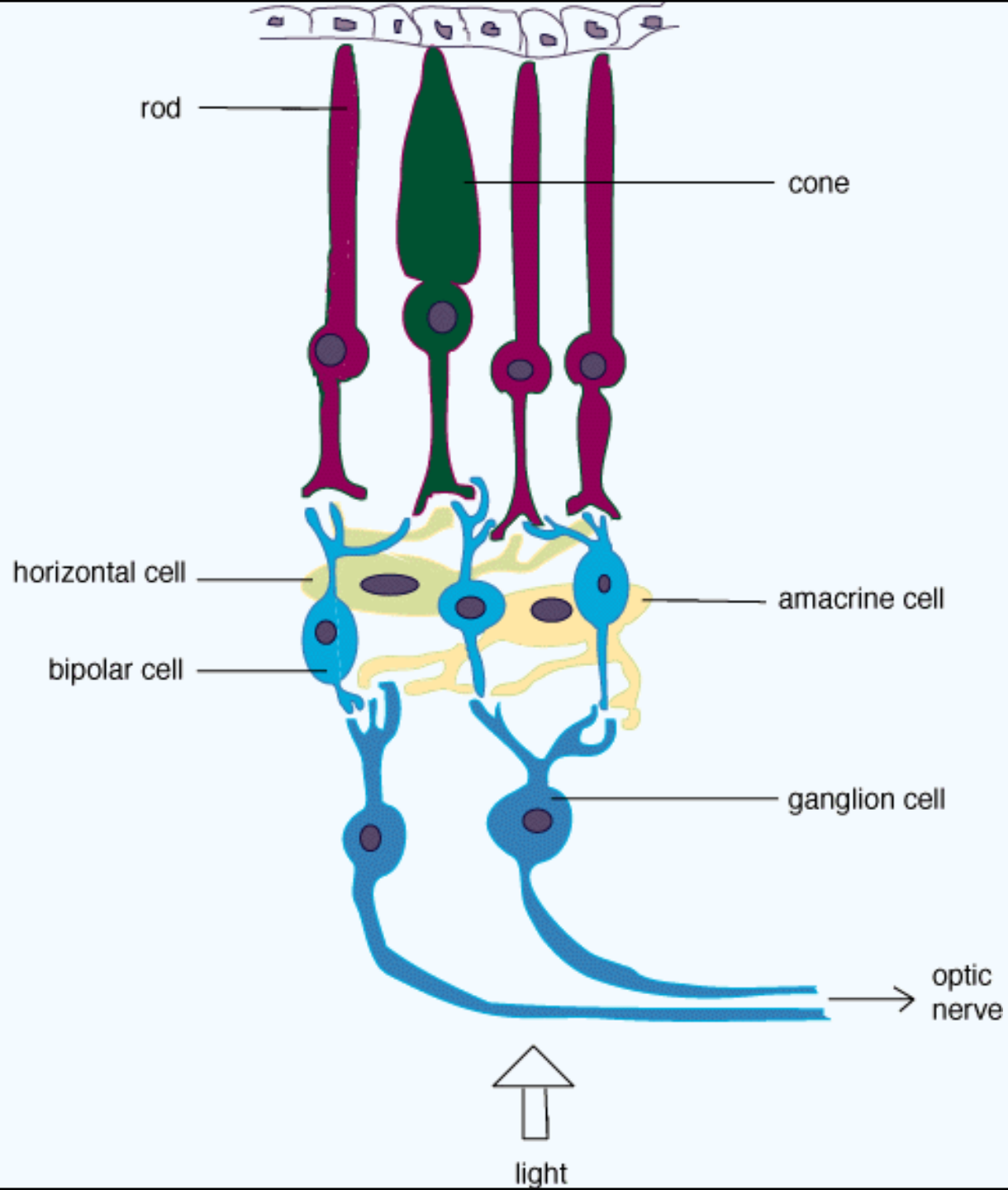
Spectral Radiance

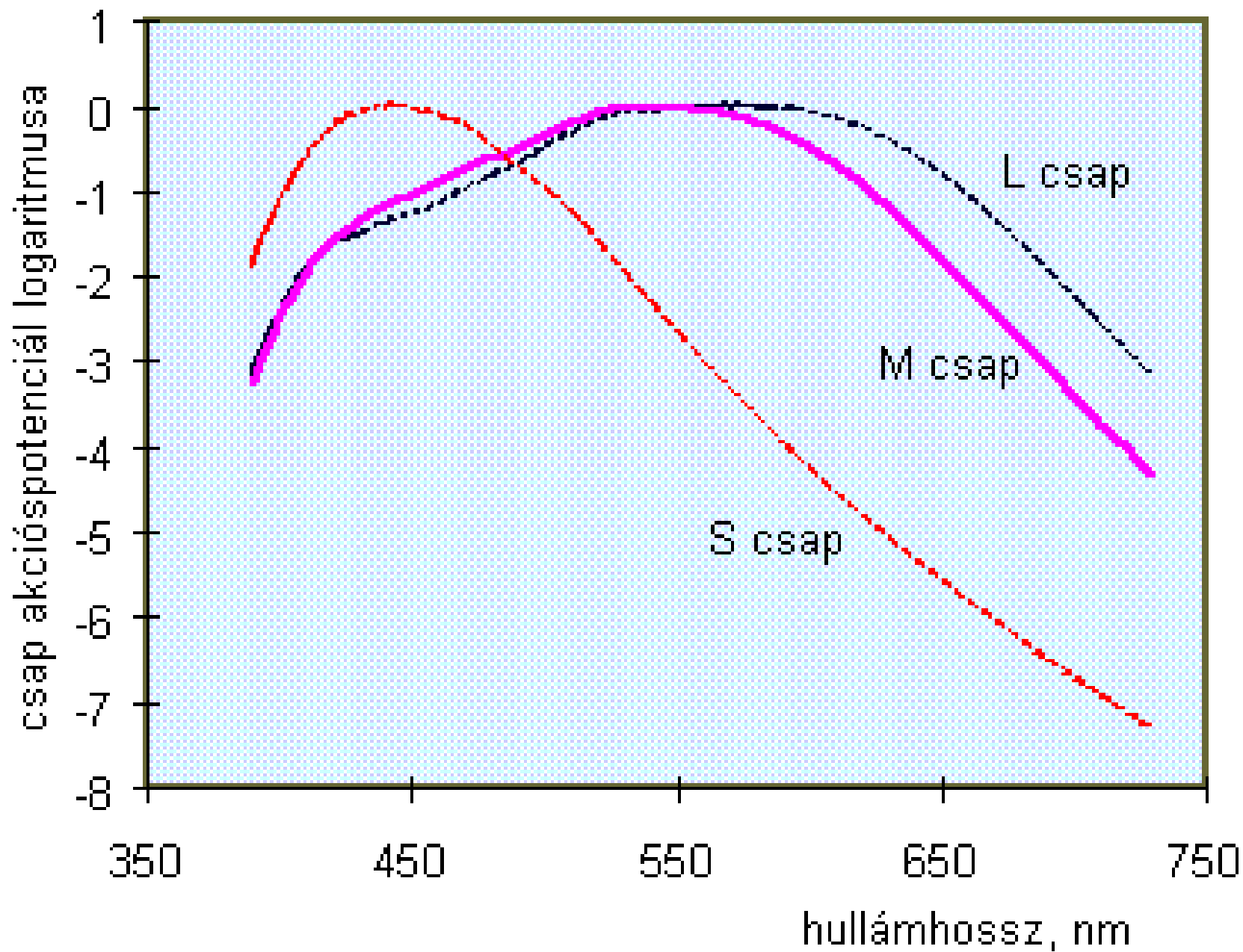
Peak @ 780 nm



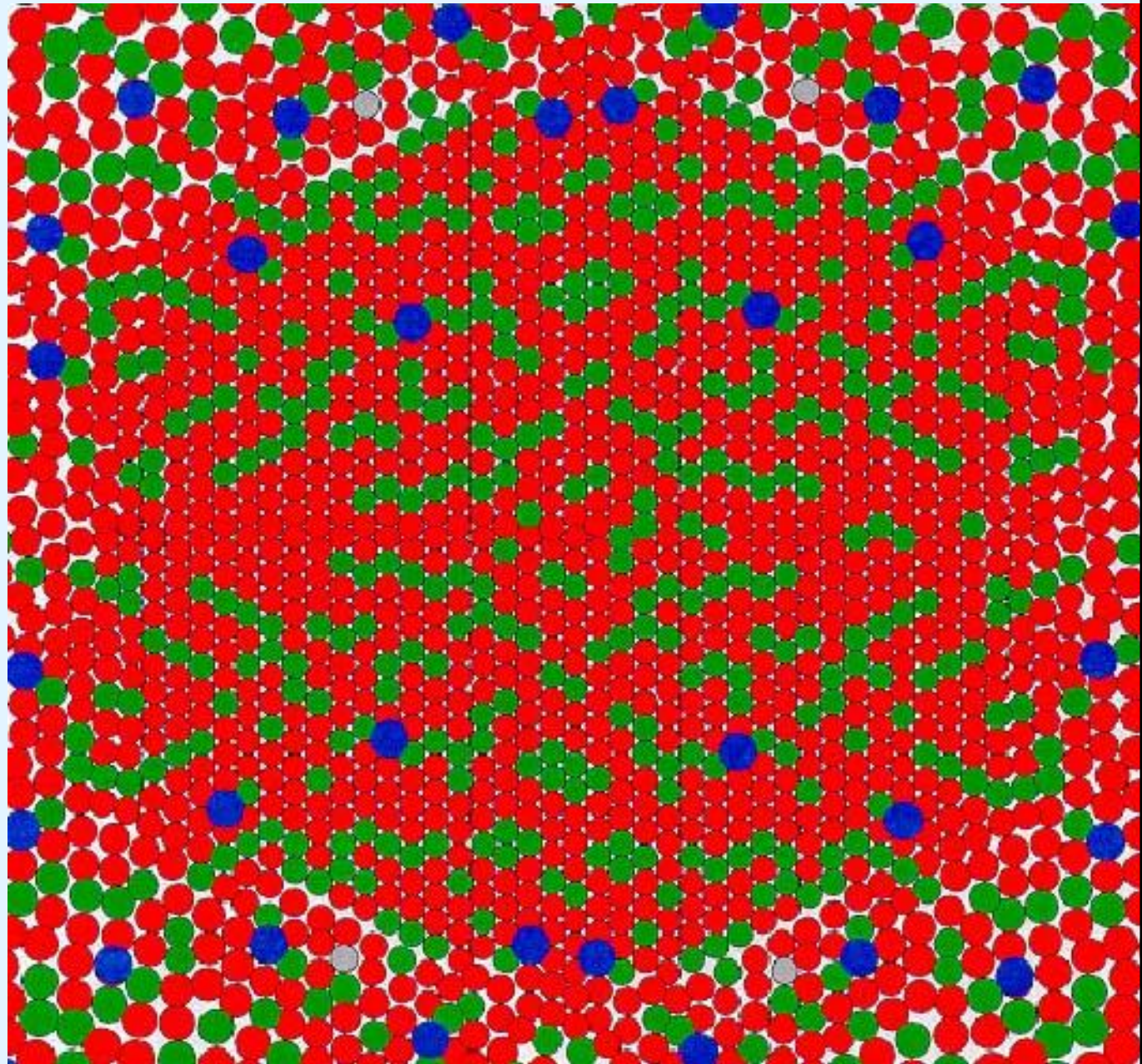
2 The human eye







S, M, L
csapok az
emberi
szemben

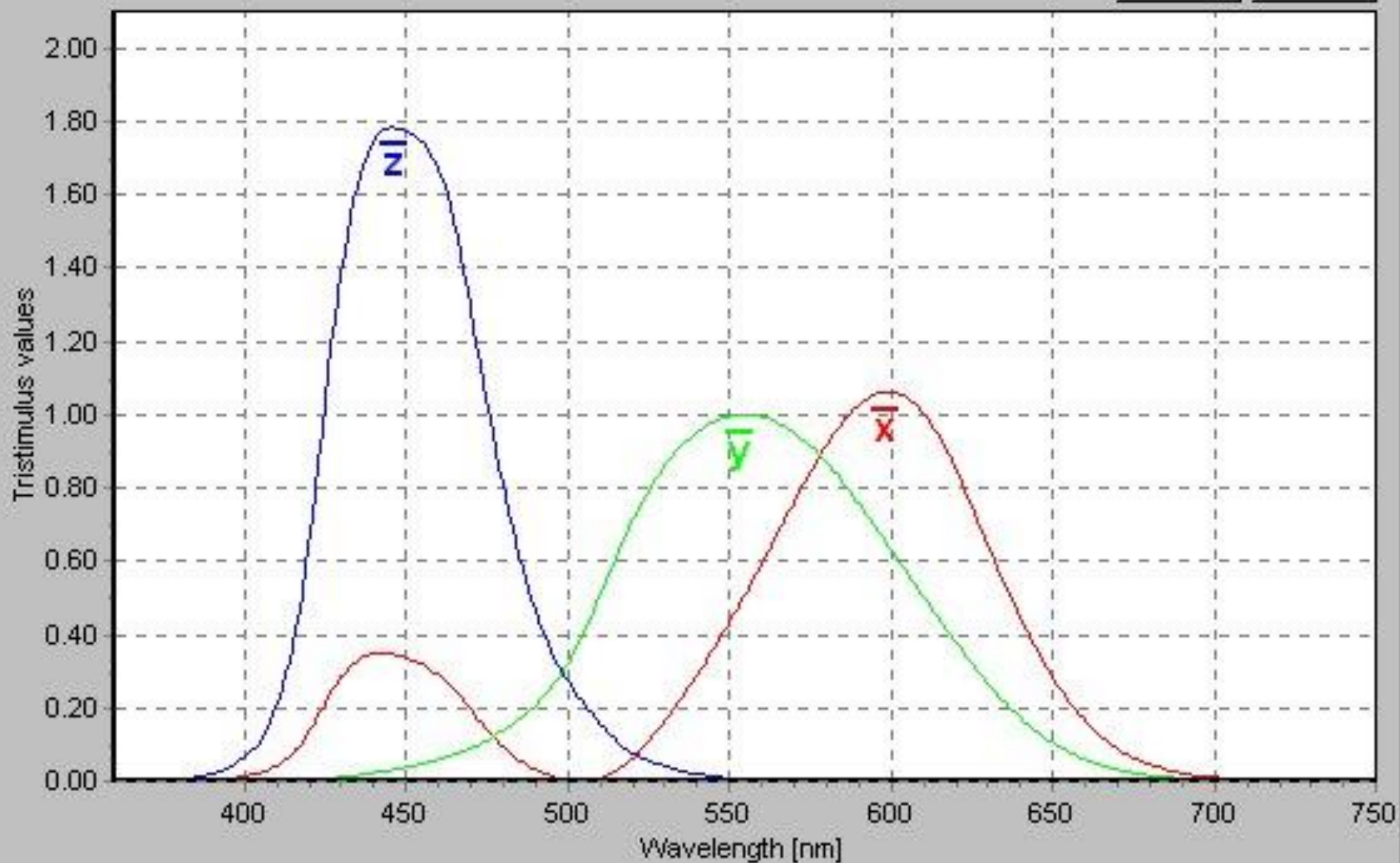


Color Matching Functions

CIE 1931 Color Matching Functions (2-degree observer)

Save As

Print



PWD Illuminant C Two Degree Standard

Exit Help About

| | | | | | | | | | |
|----------------|----------------------------------|---|------------------------------------|----|------------------------------------|-------|----------------------------------|---|---------------------------------|
| Hue (eg, 5.6R) | <input type="text" value="5yr"/> | X | <input type="text" value="25,10"/> | L* | <input type="text" value="51,57"/> | R | <input type="text" value="180"/> | C | <input type="text" value="20"/> |
| Value (1-9) | <input type="text" value="5"/> | Y | <input type="text" value="19,77"/> | a* | <input type="text" value="26,20"/> | G | <input type="text" value="103"/> | M | <input type="text" value="50"/> |
| Chroma (0-28+) | <input type="text" value="10"/> | Z | <input type="text" value="3,77"/> | b* | <input type="text" value="53,09"/> | B | <input type="text" value="31"/> | Y | <input type="text" value="78"/> |
| | | | | | | Gamma | <input type="text" value="2.2"/> | K | <input type="text" value="9"/> |



x

y



Instrument

Comm Port

Calibrate

Measure Save

- Display Hue Page
- Color Tolerance Set
- Display Value Page
- Display ColorChecker

Expires in 60 days

Munsell Conversion

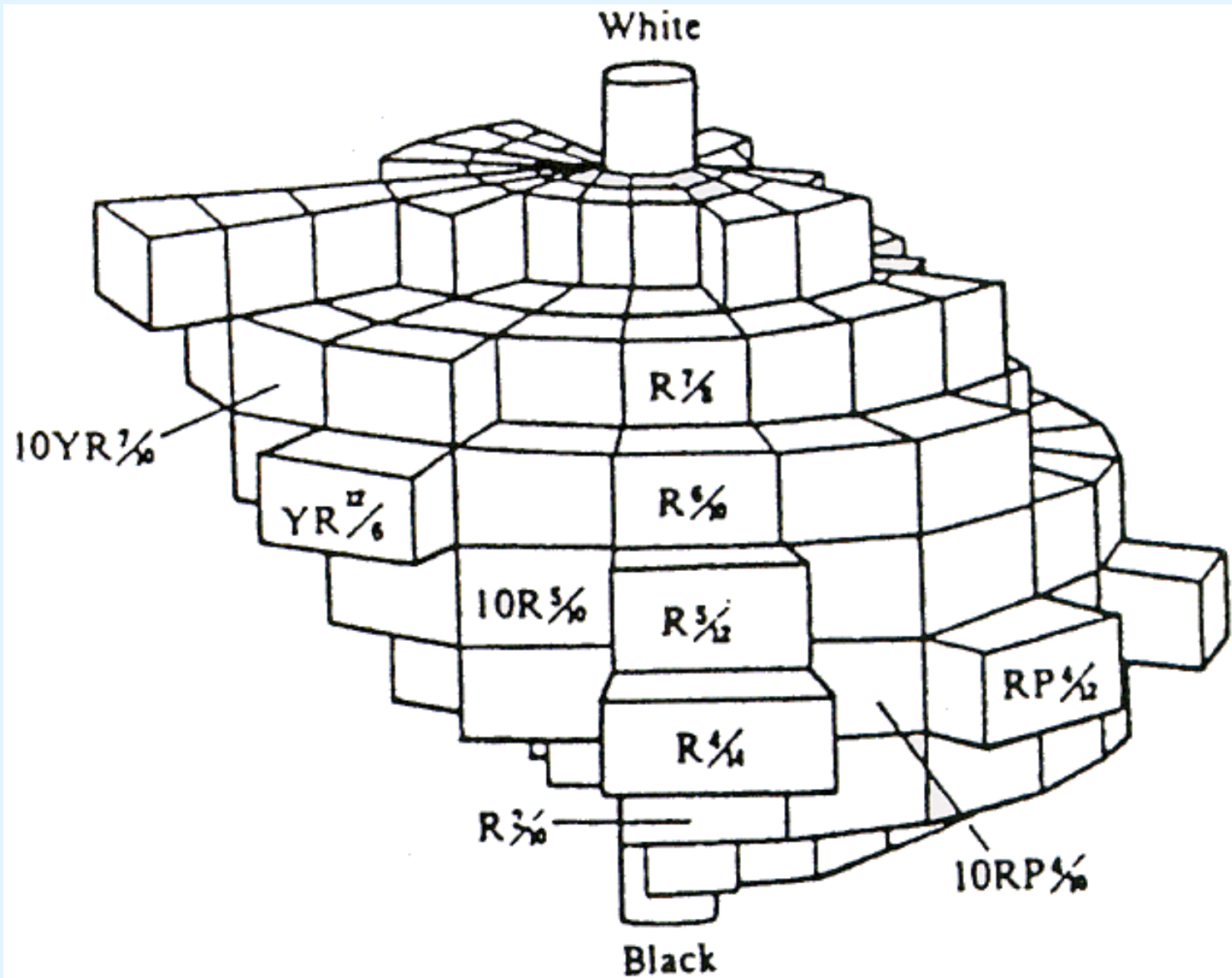


Figure 10.6.1 Munsell color system

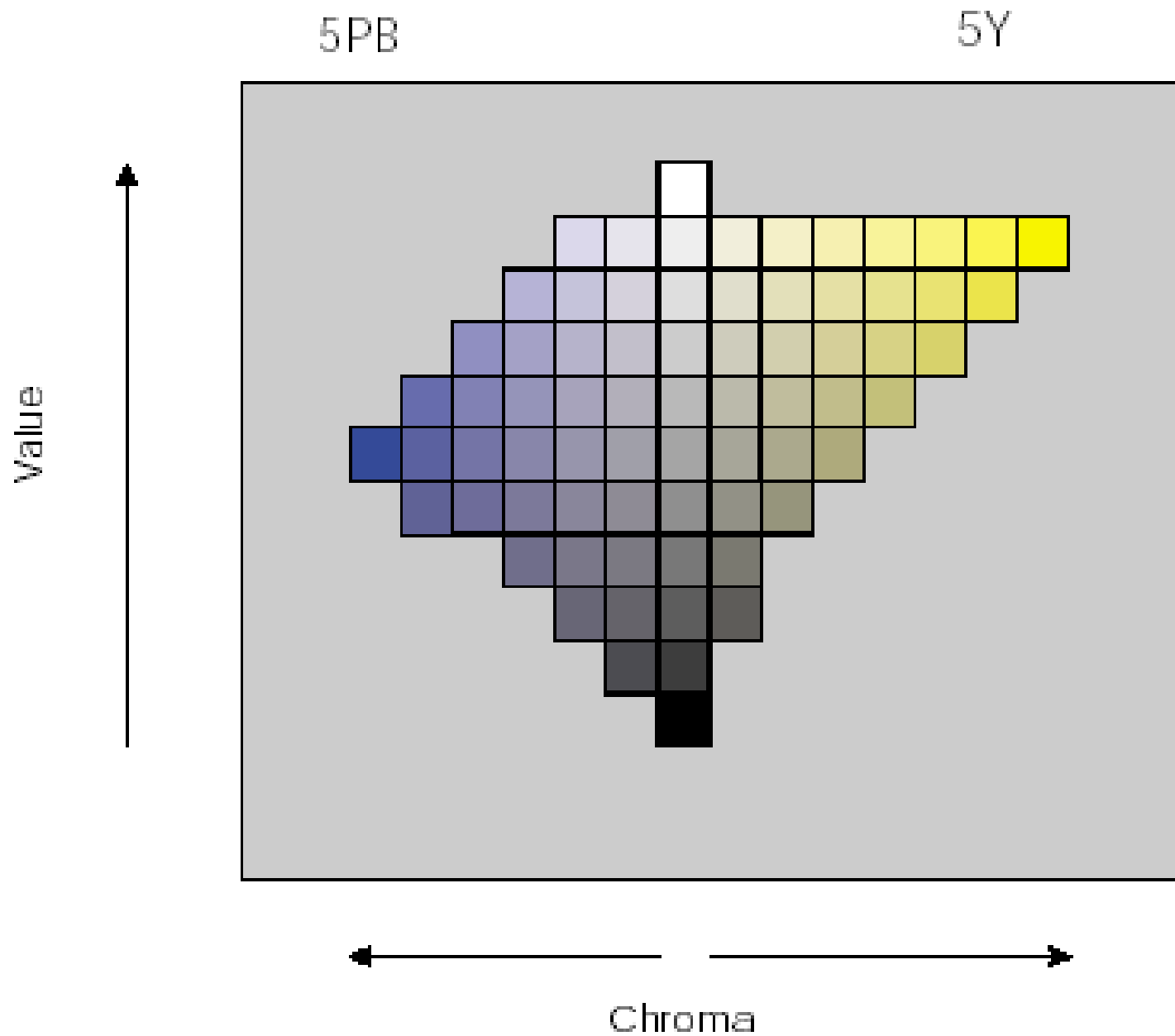
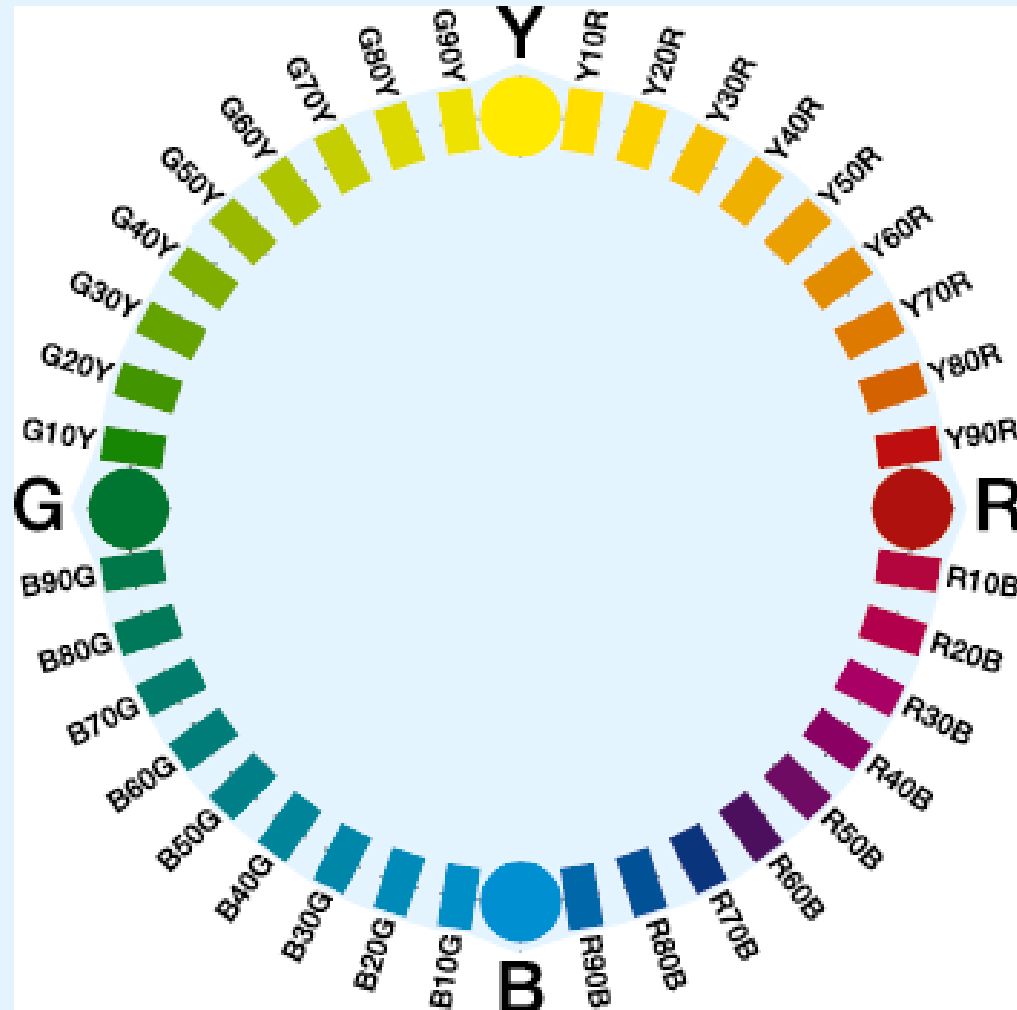


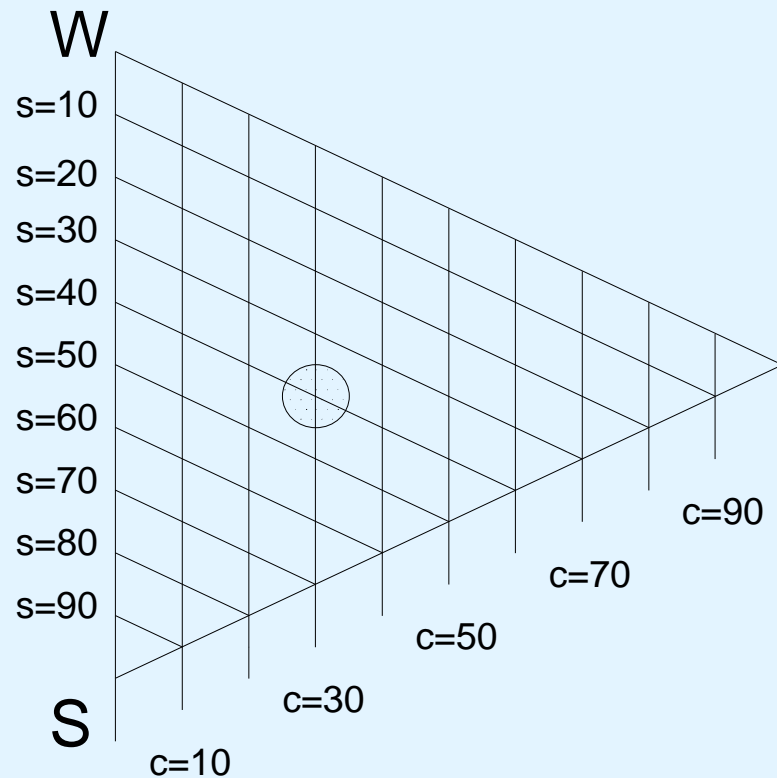
Figure 38: A pair of leaves from the Munsell system

NCS színrendszer

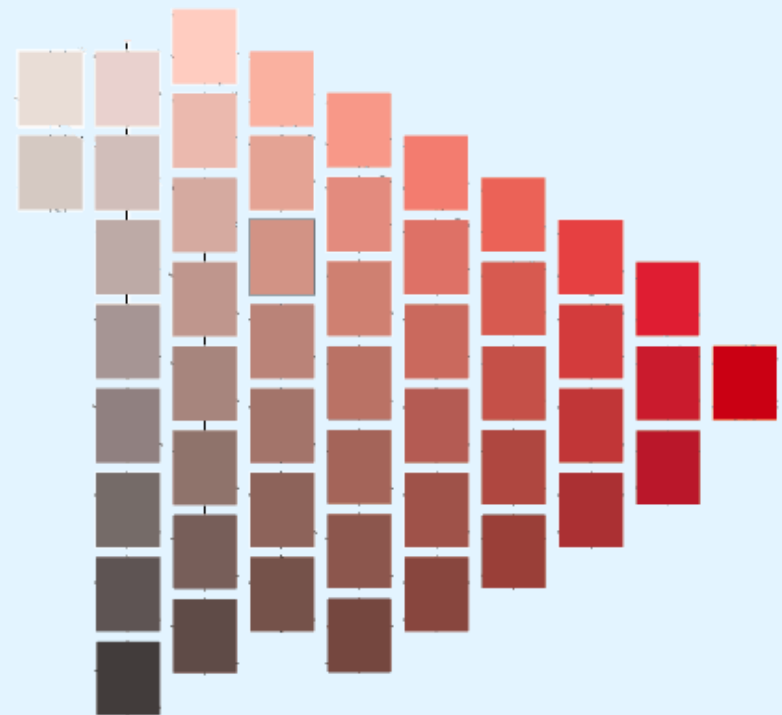
Az NCS
színezeti köre
Opponens
színezetek és
a színezetek
jelölése



Az NCS atlasz egy lapja



C

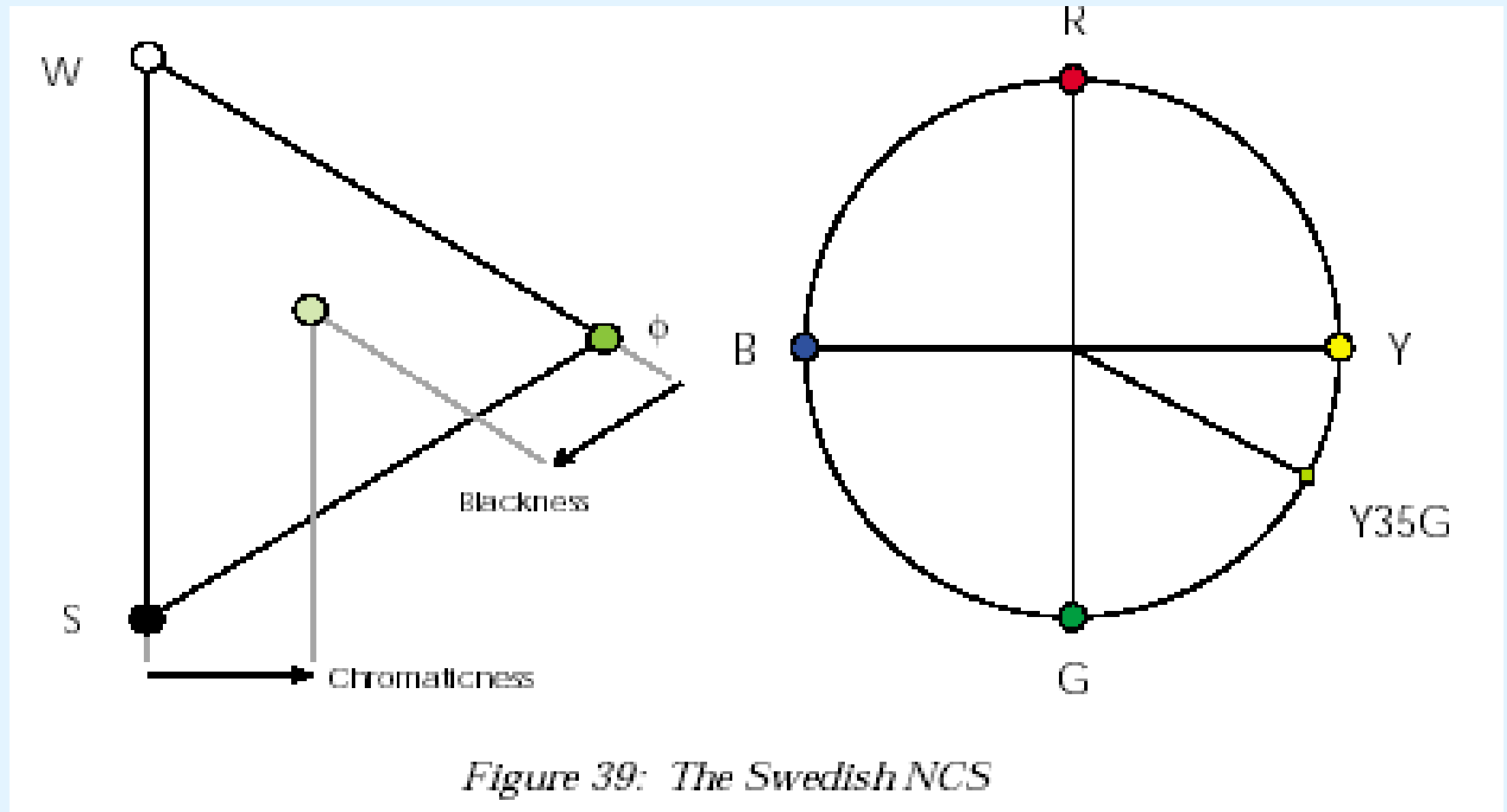


S 4030 - Y80R

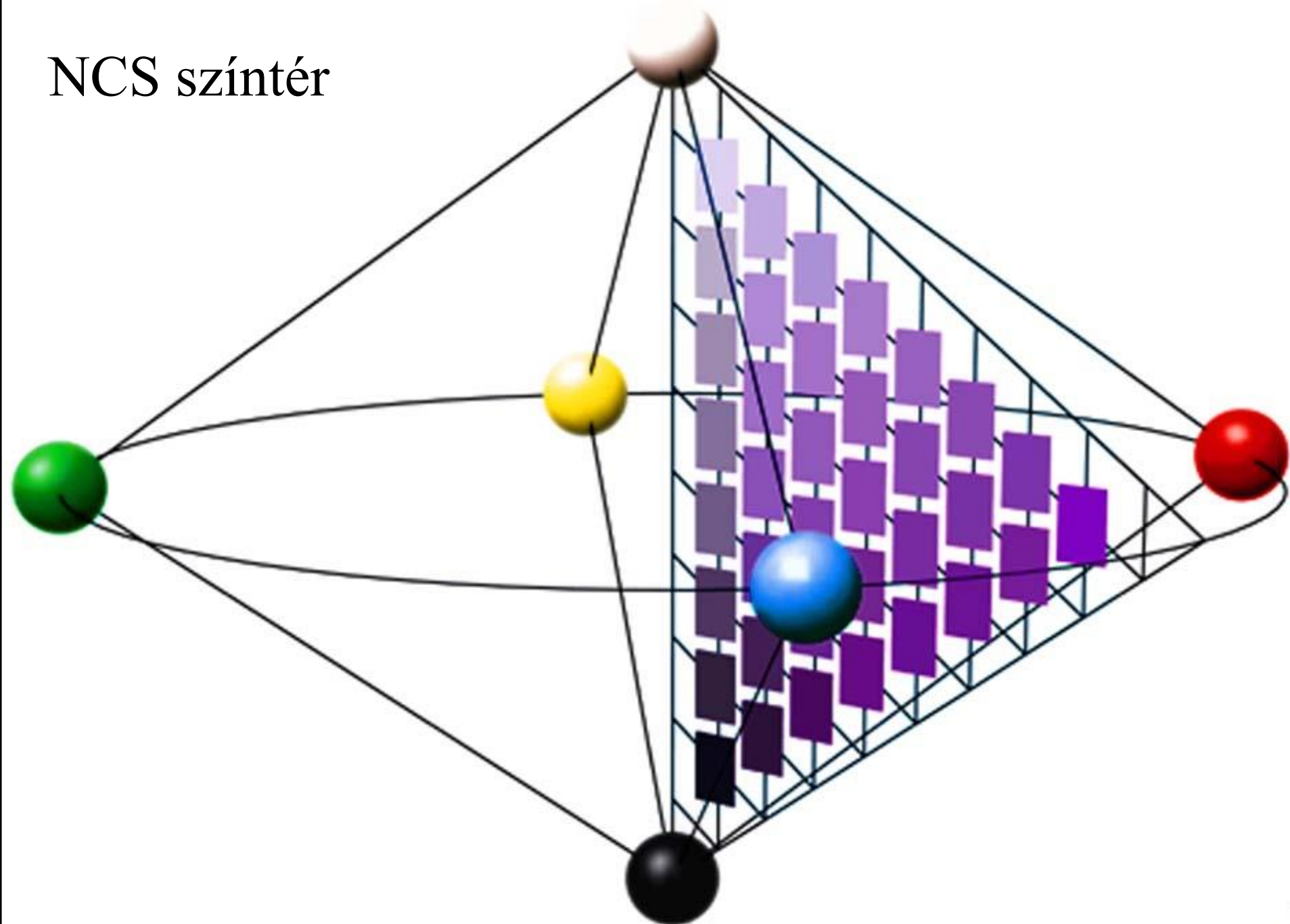
The Natural Color System, Leonardo da Vinci, Herring

Φ hue, s schwarz, c chromaticness, w white, b blackness

lime green Y35G = 65% yellow + 35% green

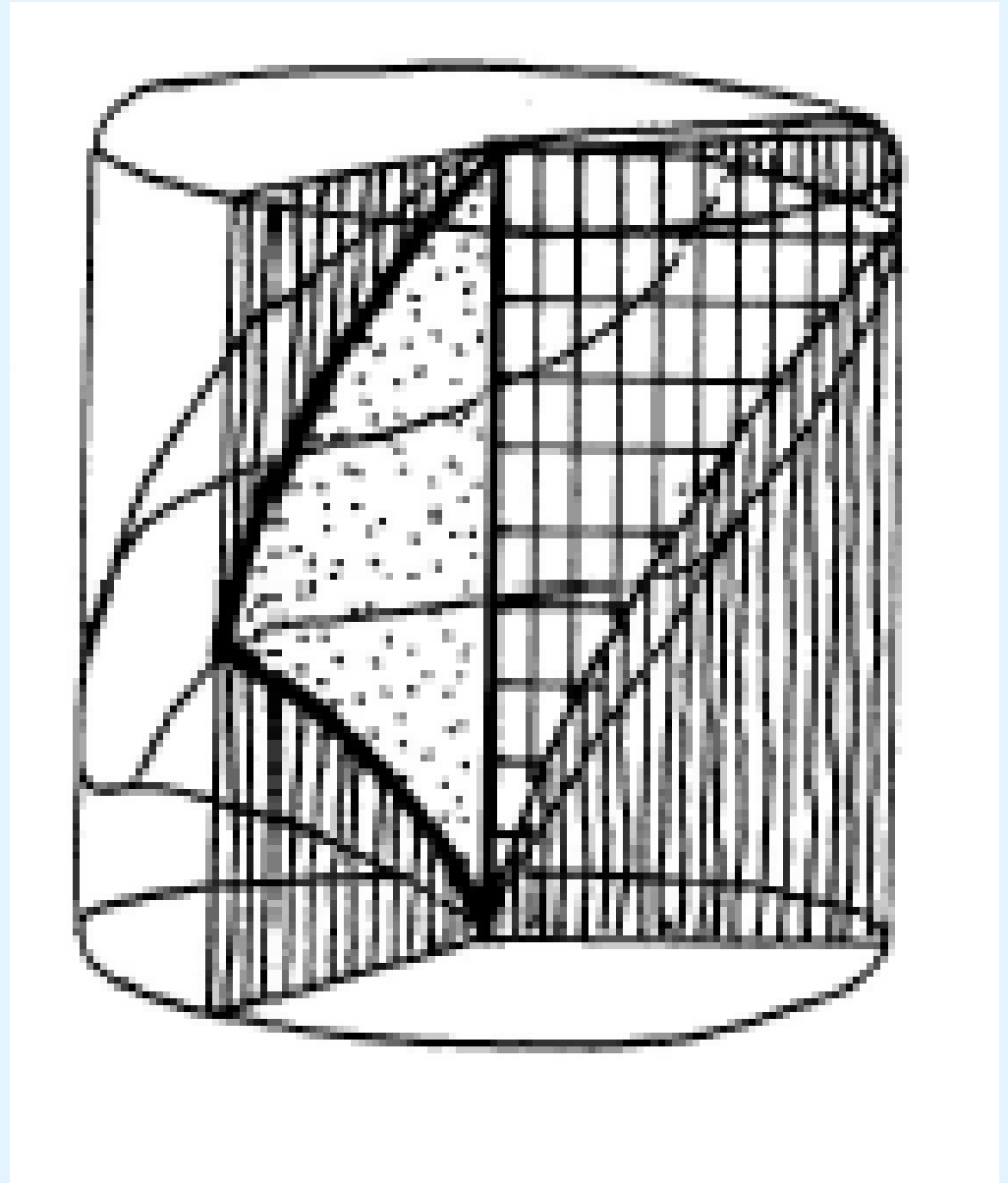


NCS szintér



COLOROID szintér
egyenlő
színtelítettségű felület
a szintérben

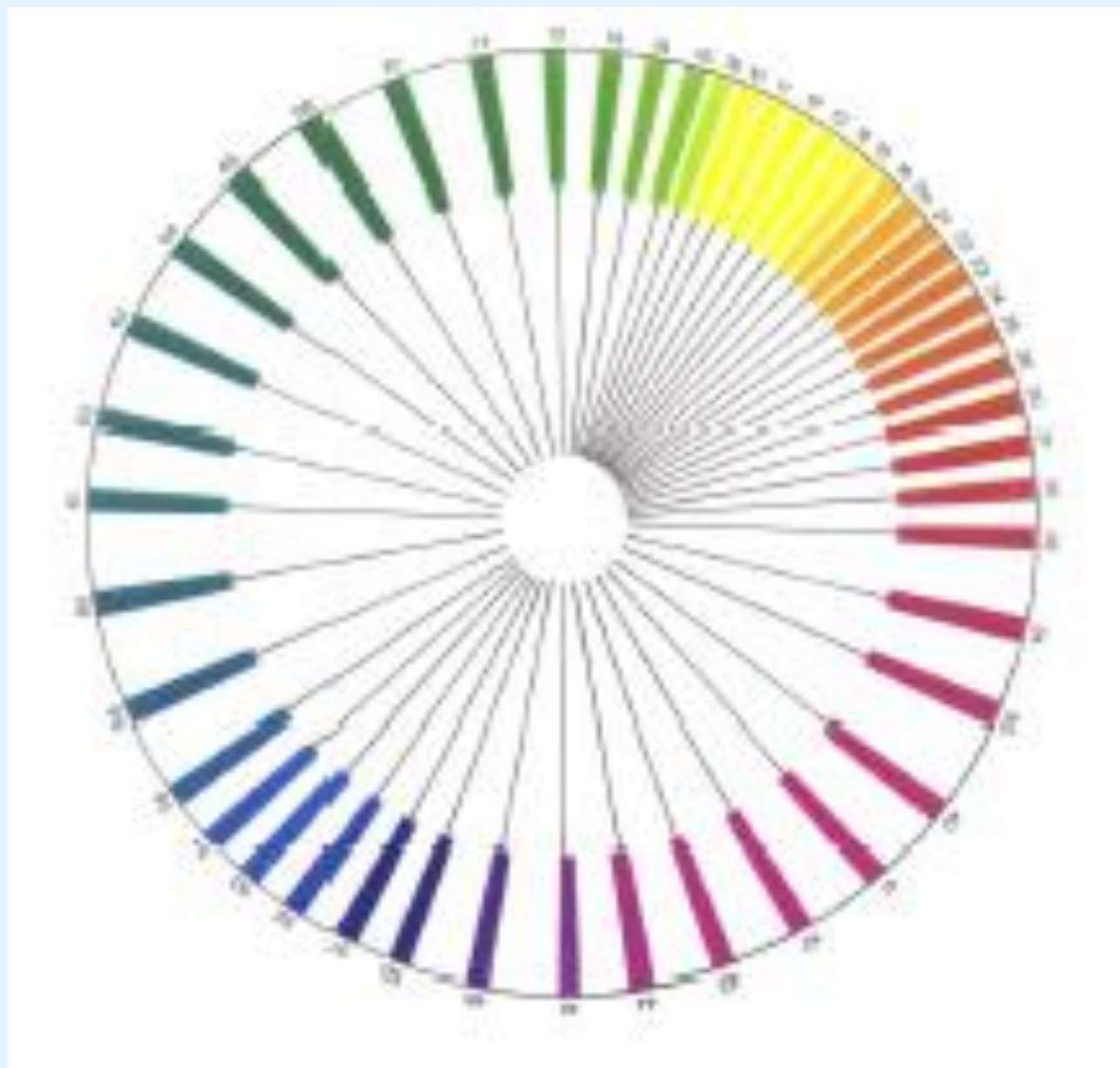
*síkmetszet a kékek és a
sárgák tartományában*



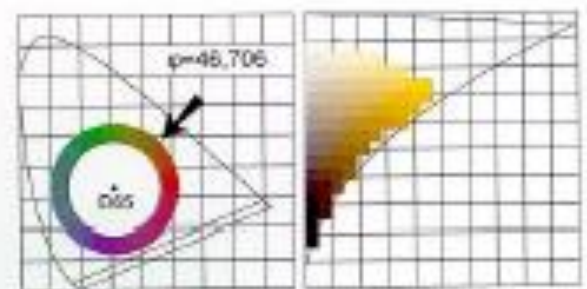
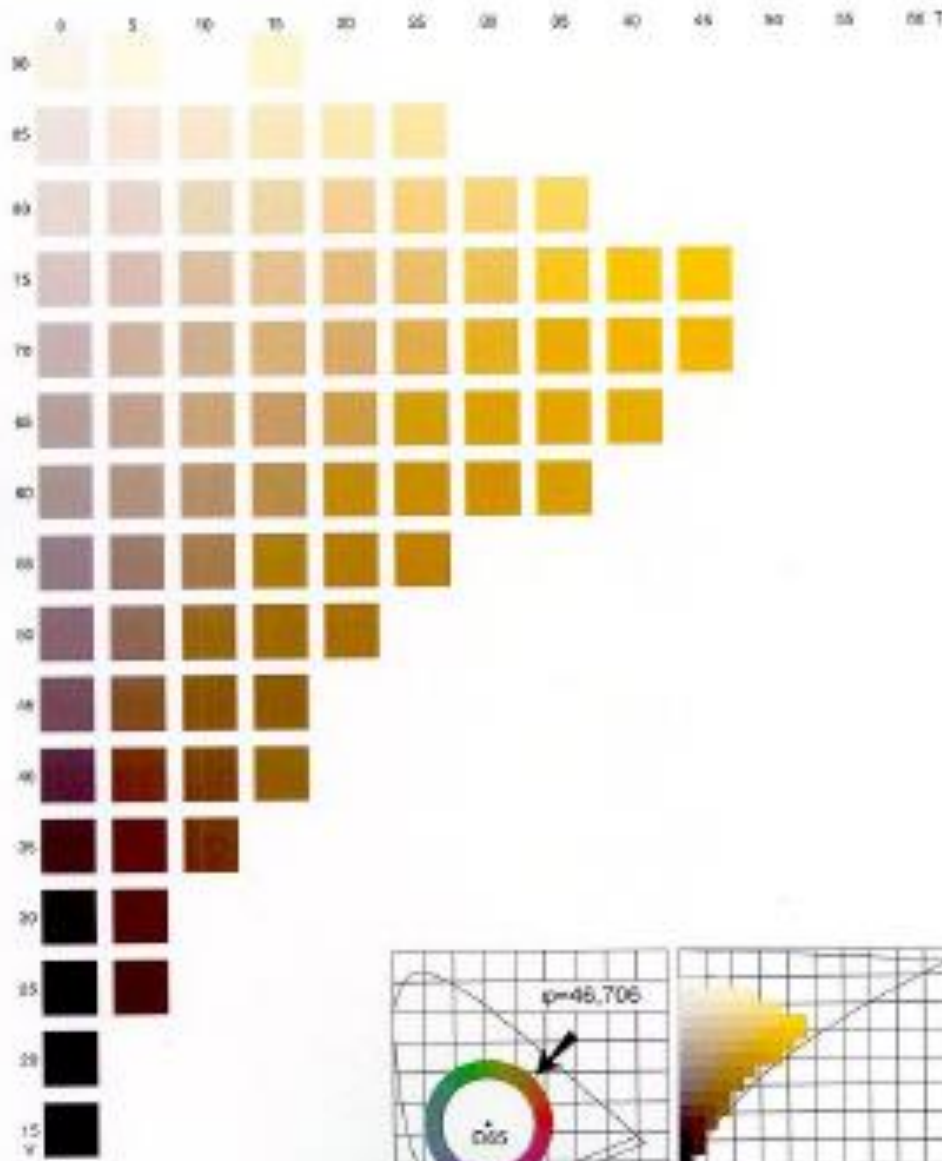
COLOROID
színekör

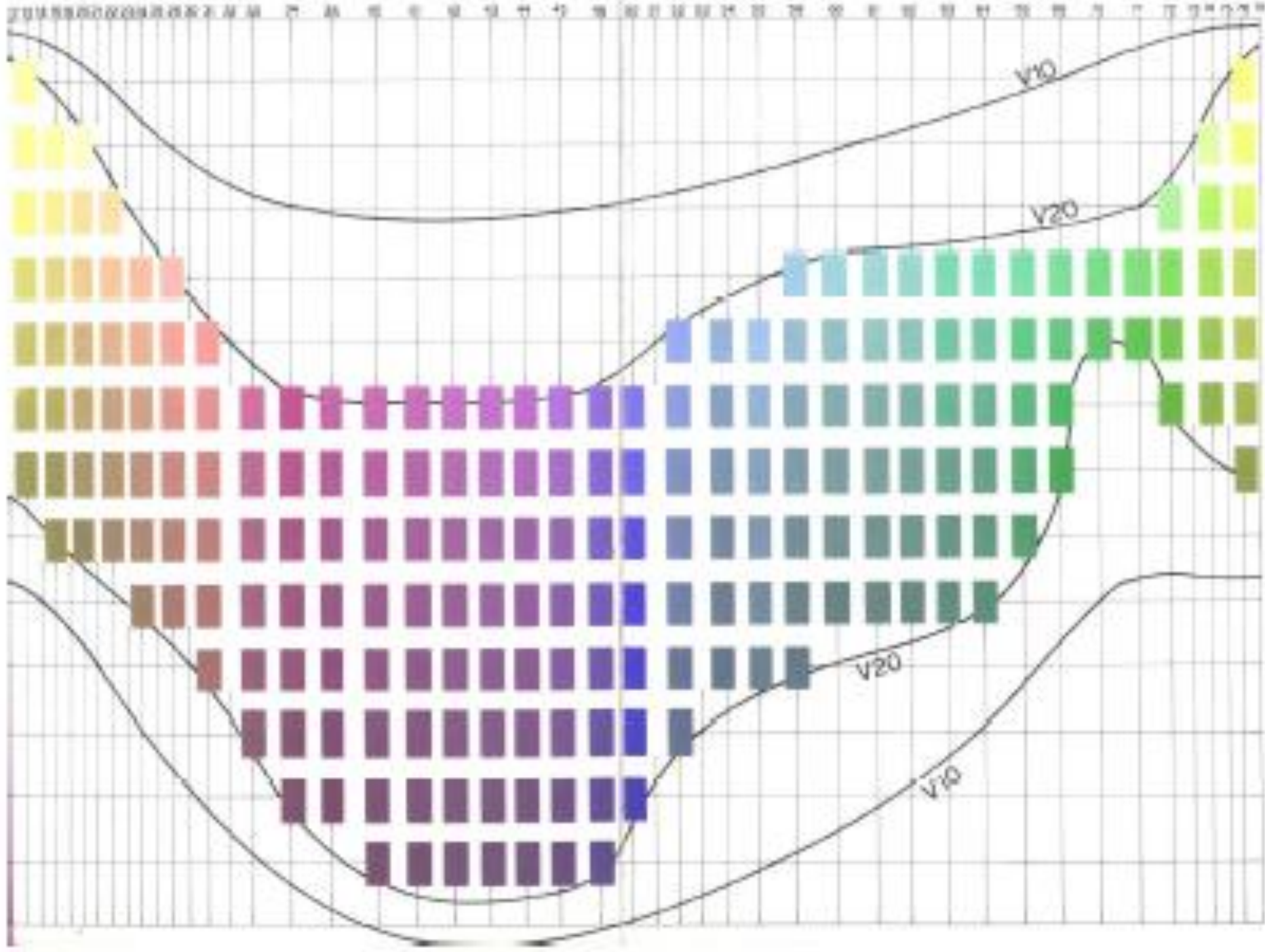
színezet

A10-től A76-ig



A színminta atlasz
egyik lapjának
képe





Coloroid

A színezet

$$\operatorname{tg} \varphi = \frac{y - y_0}{x - x_0}$$

T telítettség

$$T = 100 \frac{Y(1 - y\varepsilon_w)}{100(y\varepsilon_\lambda - y_\lambda\varepsilon_\lambda) + Y_\lambda(1 - y\varepsilon_w)}$$

V világosság

$$V = 10\sqrt{Y}$$

A CIELAB színtér szerkezete



Codex Alimentarius Commission

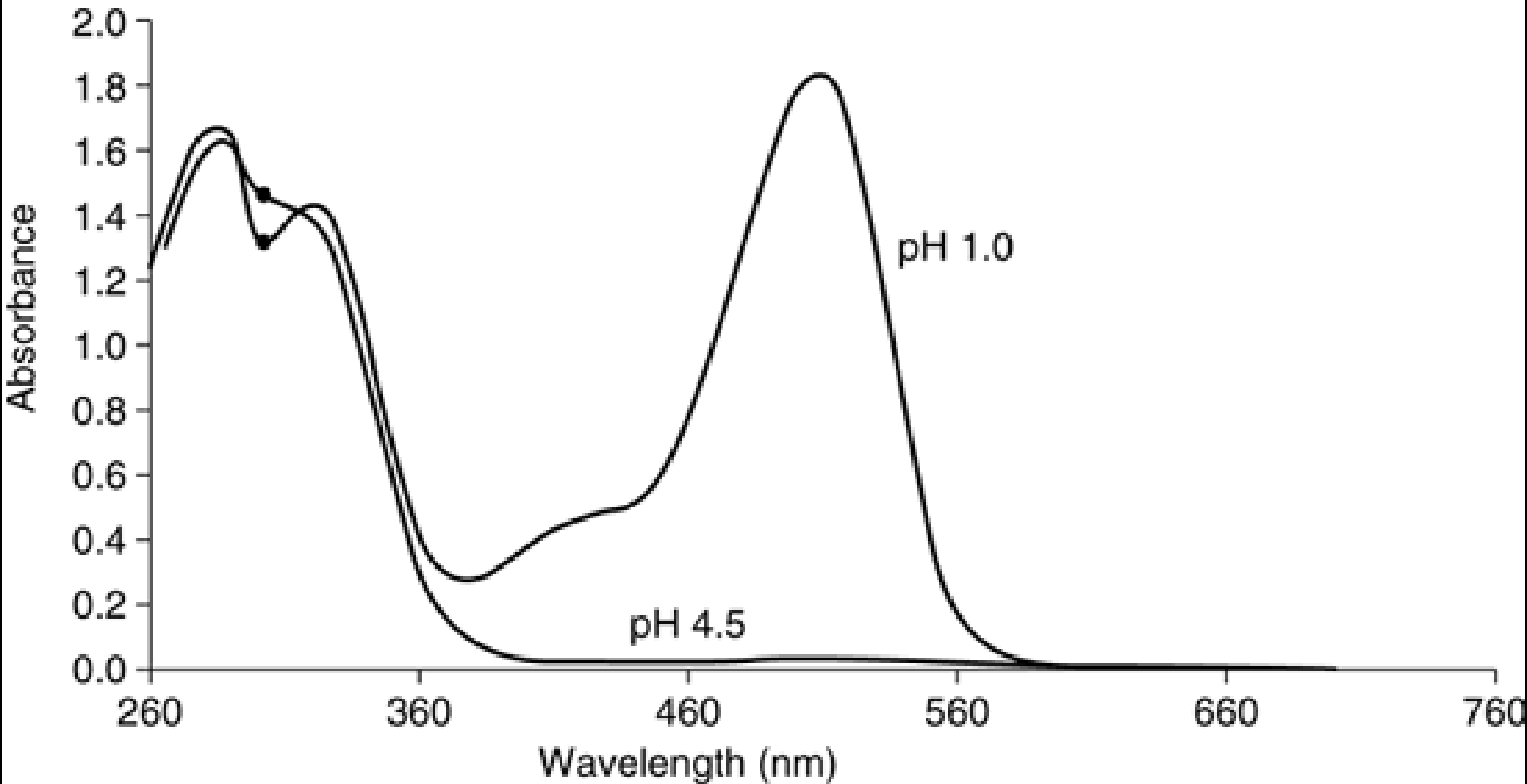
ESSENTIAL COMPOSITION AND QUALITY FACTORS

This section should contain all quantitative and other requirements as to composition including, where necessary, identity characteristics, provisions on packing media and requirements as to compulsory and optional ingredients. It should also include quality factors which are essential for the designation, definition or composition of the product concerned. Such factors could include the quality of the raw material, with the object of protecting the health of the consumer, provisions on **taste, odour, colour and texture** which may be apprehended by the senses, **and basic quality criteria for the finished products**, with the object of preventing fraud. This section may refer to tolerances for defects, such as blemishes or imperfect material, but this information should be contained in an appendix to the standard or in another advisory text.

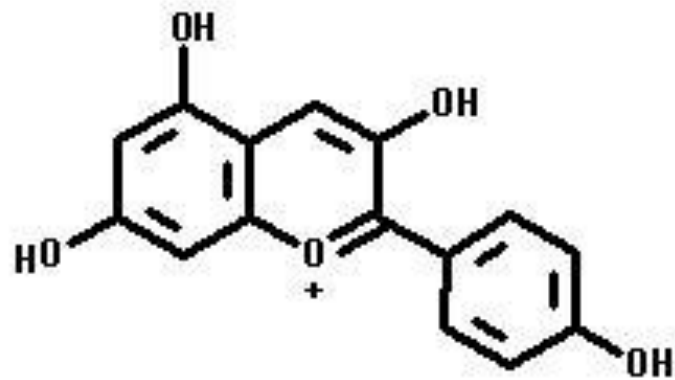
Food colorants originated from plants

| genus | species | faj |
|------------|----------------------------|------------|
| solanaceae | lycopersicon esculentum | paradicsom |
| | solanum tuberosum | burgonya |
| | capsicum annuum | paprika |
| | nicotiana tabacum | dohány |
| | solanum nigrum | csucsor |

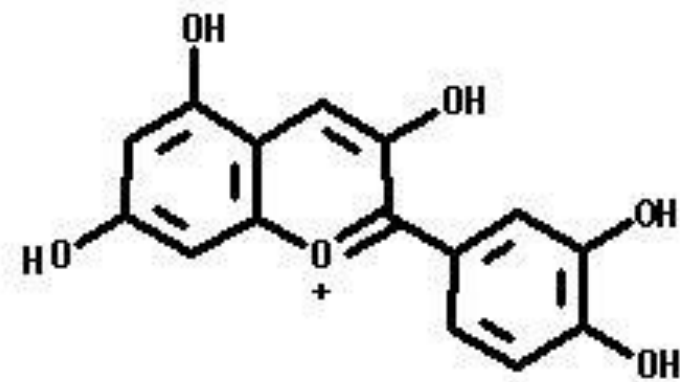
pH-dependency of anthocyanines



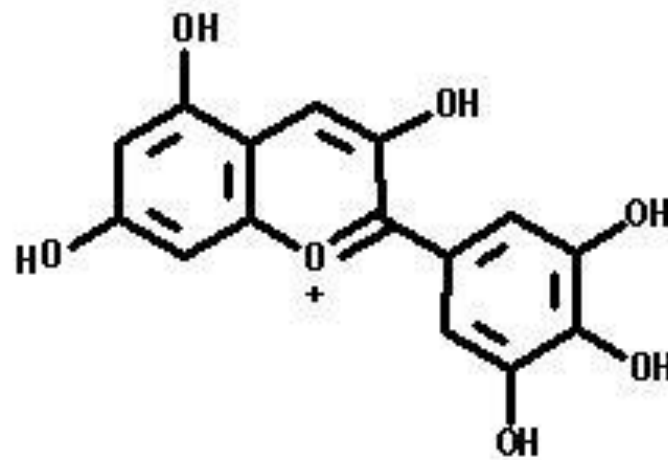
ANTHOCYANIDINS



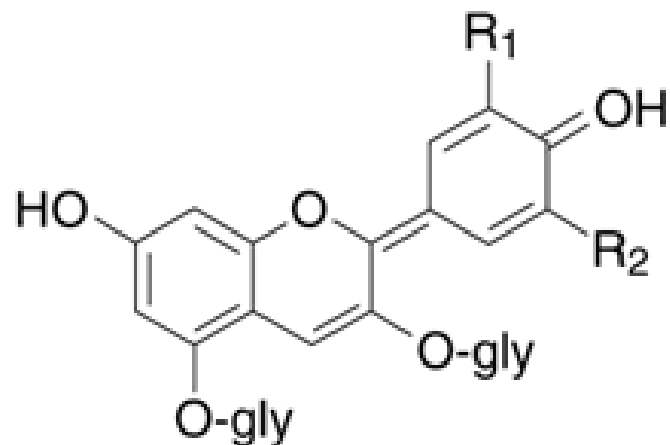
Pelargonidin



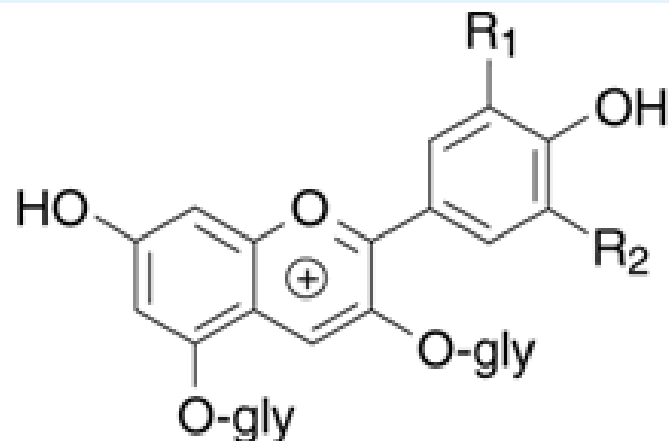
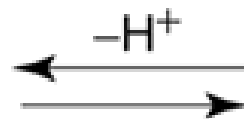
Cyanidin



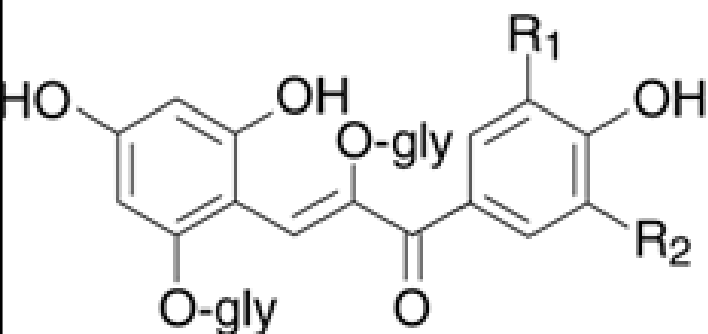
Delphinidin



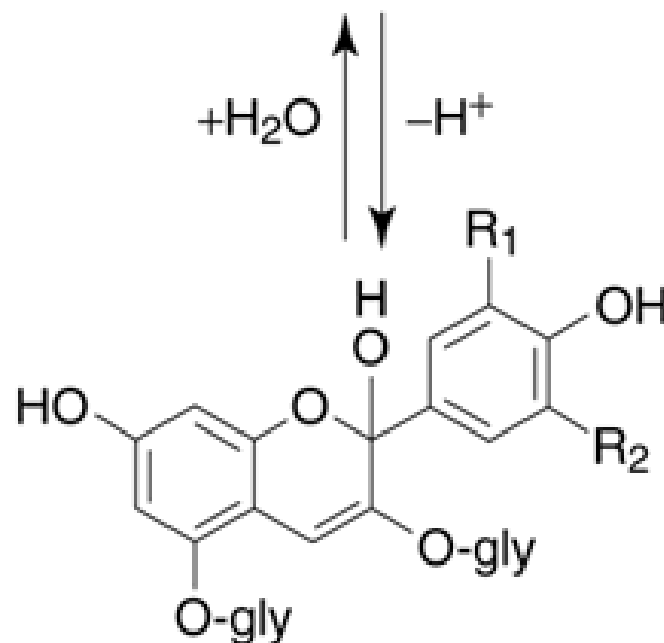
quinonoidal base: blue
pH = 7



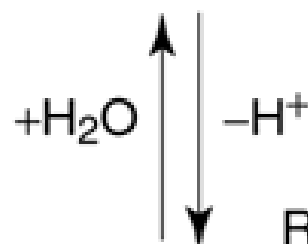
flavylum cation (oxonium form): orange to purple
pH = 1



chalcone: colorless
pH = 4.5



carbinol pseudo-base (hemiketal form): colorless
pH = 4.5



Anthocyanins (E163)

Cyanidin-3-galactoside

Cyanidin-3-glucoside

Delphinidin-3-glucoside

Malvidin-3,5-diglucoside

Pelargonidin-3-glucoside

Peonidin-3-arabinoside

Petunidin-3,5-diglucoside

Carotenoid pigments (**E161**)

| | | |
|-----------------------|-------------------------------|-------------------------|
| antheraxanthin | astaxanthin | canthaxanthin |
| α -carotene | β -carotene E160 | ϵ -carotene |
| γ -carotene | ζ -carotene | α -cryptoxanthin |
| diatoxanthin | 7,8-didehydro-astaxanthin | fucoxanthin |
| fucoxanthinol | lactucaxanthin | lutein E161b |
| lycopene E160d | neoxanthin | neurosporene |
| peridinin | phytoene | rhodopin |
| rhodopin glucoside | siphonaxanthin | spheroidene |
| spheroidenone | spirilloxanthin | uriolide |
| uriolide acetate | violaxanthin | zeaxanthin |

E 100 CURCUMIN

magyar neve: kurkumin

Synonyms CI Natural Yellow 3, Turmeric Yellow, Diferoyl Methane (*a turmeric tiltott, az oleoresin Amerikában is*)

Definition Curcumin is obtained by solvent extraction of turmeric i.e. the ground rhizomes of natural strains of *Curcuma longa* L. In order to obtain a concentrated curcumin powder, the extract is purified by crystallization. The product consists essentially of curcumins; i.e. the colouring principle (**1,7-bis(4-hydroxy-3-methoxyphenyl)hepta-1,6-dien-3,5-dione**) and its two desmethoxy derivatives in varying proportions. Minor amounts of oils and resins naturally occurring in turmeric may be present.

Class Dicinnamoylmethane

Colour Index No 75300 Einecs 207-280-5 CAS 458-37-7

Chemical names **I** 1,7-Bis(4-hydroxy-3-methoxyphenyl)hepta-1,6-diene-3,5-dione

II 1-(4-Hydroxyphenyl)-7-(4-hydroxy-3-methoxyphenyl-)hepta-1,6-diene-3,5-dione

III 1,7-Bis(4-hydroxyphenyl)hepta-1,6-diene-3,5-dione

Kurkuma virágzata



Kurkuma rizómája

