

# 专题地图色谱

COLOR CHART OF THEMATIC MAPS

(四色部分)

中国科学院  
自然地理研究所

地理研究所

地质出版社



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COLOUR CHART OF THEMATIC MAPS

上册

Vol. I

中国科学院 地理研究所  
国家计划委员会

Institute of Geography, Academia Sinica

科学顾问:  
Scientific  
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这本色谱是地图设计与整饰、图像复制与处理、地图制印及质量控制不可缺少的实用工具书。对科研教育、艺术设计和其它行业也有广泛的参考应用价值，并为今后地图用色的数据化、标准化，为建立色彩数据库提供了依据。

这本色谱的设计思想和内容构成主要是针对地图和地图集的设色及制印工艺设计的，它吸取了国内外地图色彩设计的经验和方法，处于国内领先地位。色谱的色度数据和复制数据可靠，制印精良，达到80年代国际上同类作品的水平。本色谱可作为地图色彩设计和复制的科学依据，建议尽快出版，推广使用。

——摘自《专题地图色谱》评审会议“评议书”

#### 《专题地图色谱》评审委员会

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### 专 题 地 图 色 谱

中国科学院 地理研究所  
国家计划委员会

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《专题地图色谱》证书

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这部《专题地图色谱》是我国地图，特别是专题地图及图像处理的颜色标准，同时可作为色彩数据库的数据源，对有关的科研、教育，以及印染、艺术设计和印刷等行业也有广泛的应用价值。

《专题地图色谱》包括黄、品红、青、黑四色叠色，地图常用专色叠色，85条地图连续色阶表和128个线划符号色，共3.3万多个色块。

制作质量监控的方法和技术参数如下：

一、用电子分色机及其配套的扫描片和显影机制作60线/厘米的十三级方形网点菲林母片，拷贝印刷原版。拷贝密度 $>4.2$ ，朦翳度 $<0.05$ ，各级网点比例误差 $\leq 2\%$ 。用DM-500透射密度计监测，经中国计量科学研究院鉴定。

二、用J2205型对开双色胶印机、天津油墨厂生产的向阳牌油墨、157克铜版纸、PS版印刷。室内条件：温度 $25^{\circ}\text{C}$ — $28^{\circ}\text{C}$ ，相对湿度55—65。用DM-400和FOGRA Pms信号条进行数据监控。

三、主要技术参数：

1. 晒Ps版，要求信号条上2%网点和平行细线梯尺12nm出齐。
2. 黄、品红、青、黑四色印刷，用印刷反差K值，网点扩大值 $a_i$ 及中性灰平衡曲线控制（见《专题地图色谱》说明， $P_3$ ）。
3. 专色油墨的色相和实地密度值用反射密度计的R，G，B三个滤色片的密度值控制（见说明， $P_3$ 中的表2，表3）。实地密度误差 $\leq 0.06$ 。
4. 用50倍放大镜监查网点点形。
5. 印刷色序：黄—黑，红—蓝。

四、由中国计量科学研究院标定本色谱十四种基本色和纸张的色度数据，并绘制出色度图和分光光度曲线。

凡具备一定条件的印刷厂，用上述数据和方法监控复制，颜色均可再现。

# 说 明

一、本色谱主要是为地图，特别是为专题地图及地图集的色彩设计和制印而研制的。设计时总结了我国地图，尤其是专题地图集设色的经验，也参考了国外著名地图集设色的特点。

本色谱给出了极其丰富的颜色样品，包括四色印刷的叠色系统，专题地图常用专色的叠色系统，并且收集、设计了大量的地图连续色阶表和线划、符号色。为地图色彩设计、彩色图像复制工艺的标准化、数据化提供了色样与依据，是地图设计与整饰、图像处理与复制、地图制印及质量控制不可缺少的实用工具，也是建立色彩数据库，实现计算机辅助设计的前期工程。对科研、教育、艺术设计和其它印刷部门也很有参考价值。

本色谱以色度学与彩色图像复制理论为基础，以复制技术标准化为手段，以视觉传输最佳效果为目的，各项色度数据由中国计量科学研究院审定，复制数据达到西德海得堡印刷机械公司CPC印刷标准。

本色谱制作工艺与材料立足于国内现有条件，采用软片化、网点化、标准化新工艺。凡具有一定条件的工厂均可推广应用。

二、本色谱用14个基本色，叠出33432个色块，包括以下4个叠色系统：

1. 中黄、品红、青、黑的二叠色、三叠色和四叠色，共60页，25395个色块。这是依据颜料三原色混合原理及彩色图像复制工艺设计的，特别适用于卫星像片、彩色晕渲以及各种彩色图像、照片、美术作品等的复制参考。

2. 专色二叠色和三叠色，共42页，7215个色块。主要考虑到许多专题地图普染色装饰性强，用色特殊，要求鲜艳明快的特点而设计的。分二部分：

(1) 柠檬黄、大红、孔雀蓝三叠色，共12页，2067个色块。应用这个叠色系统，可使地图上用得较多的橙色系（柠檬黄+大红）和绿色系（柠檬黄+孔雀蓝）较为明亮，以期改善图面的色彩效果。

(2) 桔黄、红棕、绿、紫、湖蓝、青灰以及柠檬黄、中黄、大红、孔雀蓝、青两两相叠，共30页，5148个色块。以满足各种专题地图用色的特殊需要。

3. 地图连续色阶表，共7页，包括85个连续色阶表，822个色块。

(1) ~ (36) 号主要根据等值线图设计的，(37) ~ (74) 号主要根据分级



统计图设计的, (75) ~ (85) 号是根据地势分层设色设计的。其中有相当部分直接采用国内外著名地图成功的色标 (有的略加调整); 也有另行设计, 以便完整地表现连续色阶的结构和用色类型。

4. 地图线划符号色, 共 2 页, 128 种。重点考虑专题地图, 同时也顾及到地形图、普通地图线划符号的用色, 基本包括了地图上线划符号用色的范畴, 且附有线状、点状和面状符号样品, 便于选用。这些线划符号色, 一部分用单色油墨印, 大多数用不同油墨、不同网点比例叠印而成, 以便考虑符号同普染色合版制印。除了阳像符号色外, 还有反衬符号色, 这是目前专题地图符号用色的一个新发展, 也是丰富专题地图内容, 改善图面效果的好办法。

三、本色谱用 150 线方形网点菲林, 彩色和灰色版分 3 %、5 %、10 %、15 %、20 %、30 %、40 %、50 %、60 %、70 %、80 %、90 %、100 % 十三级。黑色版分 3 %、5 %、10 %、15 %、20 %、30 %、40 %、50 %、60 % 九级。菲林角度, 在中黄、品红、青、黑以及柠檬黄、大红、孔雀蓝两个叠色系统部分为: 黄 90°、红 45°、蓝 15°、黑 75°, 专色二叠色用 45°、15°, 连续色阶表和线划符号色用 75°、45°、15°。

四、本色谱用 157 克铜版纸, 天津油墨厂生产的油墨, 国产 J2205 型双色对开胶印机印刷。纸张的密度和色度数据见表 1。油墨尽量采用原盒墨, 有的则调配而得, 油墨编号如下: 中黄 EXG-236 (8139)、品红 EXG-135 (8239)、青 EXG-425 (8449)、黑 8729、柠檬黄 8114、大红 8224、孔雀蓝 8459、桔黄 3150、绿 84-5-3 (地图绿)、棕 84-5-3 (等高线棕), 红棕、紫、湖蓝、青灰调配而成。

表 1 157 克铜版纸的密度和色度数据

Table 1 Density and chromaticity of 157gm coated paper

密 度 值 Density value			三 刺 激 值 Tristimulus value			色 度 坐 标 Chromaticity coordinates		匀 色 空 间 坐 标 Uniform colour space coordinates		
R	G	B	X	Y	Z	x	y	L*	a*	b*
0.07	0.09	0.08	80.29	81.96	94.72	31.24	31.89	92.56	-0.14	1.35

五、色谱制作的全过程, 用 DM-500 透射密度计、DM-400 反射密度计和 FOGRA Pms 信号条进行了严格的质量检测, 主要技术参数如下:

1. 网点菲林百分数拷贝阳版误差  $\leq 2\%$ 。经中国计量科学研究院鉴定。

2. 阳图PS版的分辨率8 nm。
3. 四色油墨印刷的最佳实地密度、印刷反差、网点扩大值见表2。

表2 四色油墨的复制数据

Table 2 Reproduction data of four colour inks

颜 色 Colour	实地密度DS Colour solid density	印刷反差K( 网点80%处) Print contrast (80%screen)	网点扩大值ai (网点80%处) Screen expanding value (80%screen)
中 黄(Y)	$1.10 \pm 0.05$	$0.32 \pm 0.04$	$9\% \pm 2$
品 红(M)	$1.40 \pm 0.05$	$0.42 \pm 0.05$	
青 (C)	$1.55 \pm 0.05$	$0.44 \pm 0.05$	
黑 (Bk)	$1.70 \pm 0.05$	$0.48 \pm 0.06$	

4. 专色油墨的实地密度见表3。

表3 专色油墨印刷的实地密度

Table 3 Solid density of ink print in special colours

颜 色 Colour		柠檬黄 (Lm)	大 红 (R)	孔雀蓝 (Pe)	湖 蓝 (gB)	桔 黄 (O)	棕 (Bn)	红 棕 (rBn)	绿 (G)	紫 (P)	青灰 (Gy)
实地 密度 Solid density	R	0.09	0.13	1.50	0.70	0.09	0.33	0.11	0.80	0.54	0.70
	G	0.10	1.37	0.56	0.30	0.58	0.58	0.80	0.25	1.32	0.62
	B	0.72	1.03	0.27	0.16	1.30	1.00	1.22	0.80	0.69	0.57

5. 灰平衡曲线见图1。

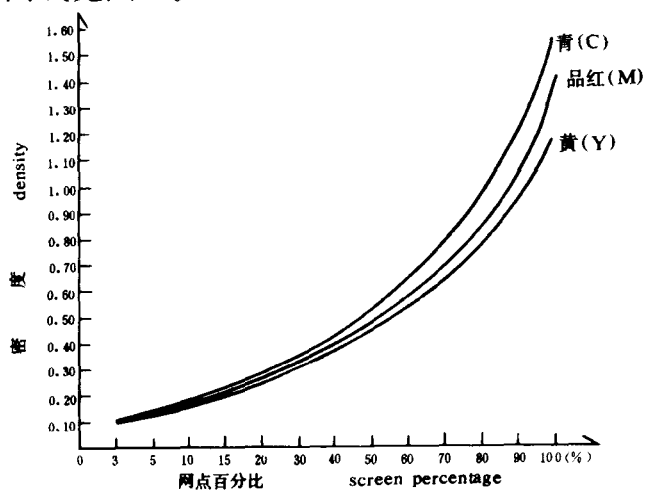


图1 中性灰平衡曲线图  
Fig1 Balance curve of medium gray



六、本色谱的色度数据, 包括14个基本色的三刺激值X、Y、Z, 色度坐标x、y, 匀色空间坐标L\*、a\*、b\*, 主波长 $\lambda$  (色相), 反射系数Y (明度) 和光谱纯度pe (饱和度), 见表4及图2、图3。这些数据由中国计量科学研究院标定。

表4 14个基本色的色度数据  
Table 4 Chromaticity data for 14 basic colours

颜 色 Colour	三 刺 激 值 Tristimulus value			色度坐标 Chromaticity coordinates		匀色空间坐标 Uniform colour space coordinates			主波长 Dominant wavelength	光谱纯度 Purity
	X	Y	Z	x	y	L*	a*	b*	$\lambda$	pe
中 黄(Y)	64.54	72.41	13.15	43.00	48.24	86.17	-14.05	83.38	573	0.77
品 红(M)	36.54	20.95	25.07	44.26	25.38	52.89	62.85	-0.52	496.5 <sup>▲</sup>	0.50
青 (C)	19.72	23.40	70.59	17.34	20.58	55.48	-15.16	-45.22	480.2	0.62
黑 (Bk)	7.00	6.92	7.61	32.51	32.14	31.62	2.14	1.93		
柠檬黄(Lm)	65.44	76.61	21.00	40.13	46.99	90.14	-20.55	70.54	570.5	0.66
大 红(R)	40.29	24.23	16.54	49.70	29.89	56.32	60.01	20.82	638	0.46
孔雀蓝(Pe)	18.66	23.93	62.73	17.72	22.72	56.02	-22.82	-37.80	482.5	0.58
湖 蓝(gB)	34.88	42.72	76.89	22.58	27.65	71.36	-22.29	-22.71	485	0.35
桔 黄(O)	56.31	46.15	9.88	50.12	41.08	73.61	29.22	67.08	587.1	0.77
棕 (Bn)	39.03	37.42	18.23	41.22	39.52	67.59	7.50	36.81	581	0.49
红 棕(rBn)	43.45	30.52	10.53	51.42	36.12	62.10	44.56	45.31	597.1	0.67
绿 (G)	31.97	49.01	21.01	31.35	48.05	75.46	-50.07	45.20	553	0.46
紫 (P)	23.01	15.36	28.67	34.32	22.91	46.12	40.64	-17.65	526 <sup>▲</sup>	0.42
青 灰(Gy)	21.50	23.72	31.36	28.07	30.97	55.81	-8.00	-4.75	488.5	0.12

注: 有“<sup>▲</sup>”的是补色波长

Note: Mark “<sup>▲</sup>” represents the complementary wavelength.

七、为便于使用和交流, 每一页的左侧、上方和左上方 (每个连续色阶表的右侧, 线划符号色的左侧) 都附有该页叠色的基本色, 并注明网点百分数, 读者能很方便地找到每一个叠色色块的基本色及其网点比例。在每一页的下方都附有该页基本色的实地色样, 供打样、印刷参考。

本色谱叠色色块编号的方法是: 页码 (1~102) 与每个版面上色块的编号 (1~169) 组合, 例如P12·125, 指第12页第125号色块。凡有黑色网点叠印的, 后面再加黑网点的比例数, 如P26·12·15, 指第26页、第12号色块中黑网点比例为15%的那个小色块。

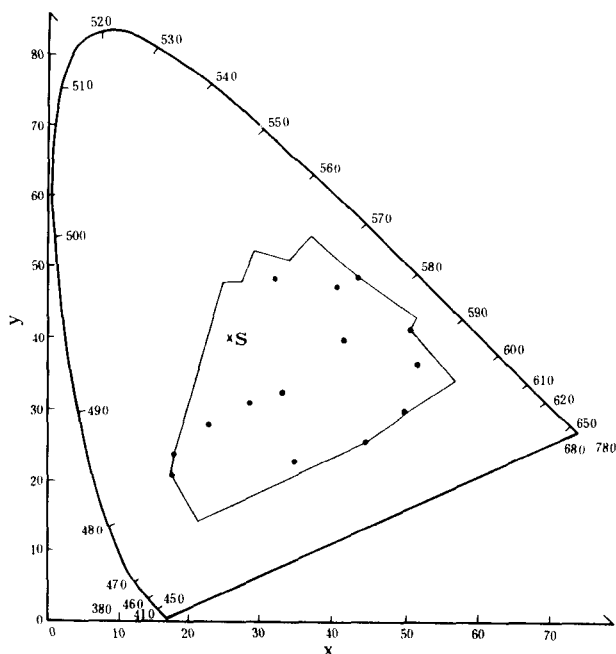


图2 色度图

Fig 2 Chromaticity diagram

14种基本色的色度位置及叠色系统的复盖范围  
Chromaticity coordinates of 14 basic colours  
and coverage area of superimposed system

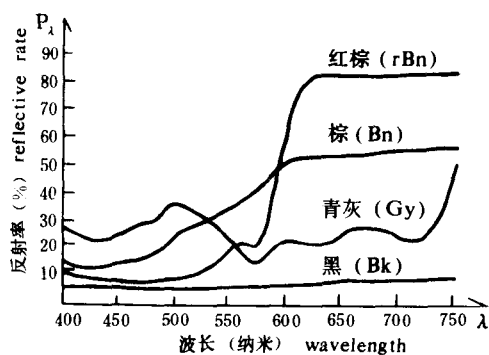
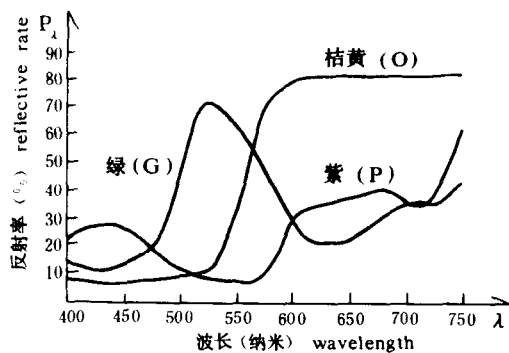
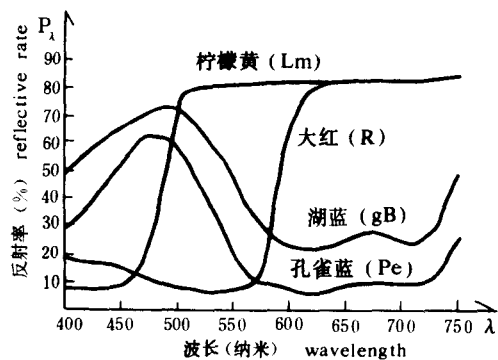
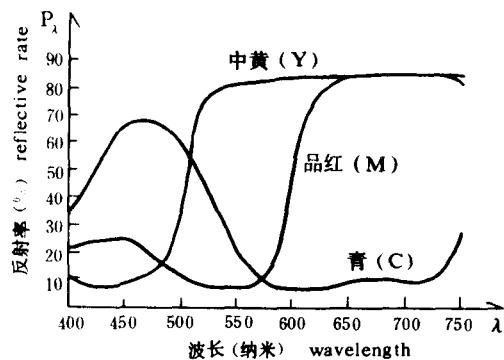


图3 分光光度曲线图

Fig 3 Spectrophotometric curve

表达连续色阶表的方法是：页码与连续色阶表编号（1～85）以及色阶表中的格数（1～n）组合，例如：P103·（8）·1～7，指第103页第（8）个色阶表中1～7格。

表示线划符号色的方法是：页码与线划符号色编号（1～64）以及正、负号组合（正号表示正像符号色，负号表示反衬符号色），例如P110·②<sub>-</sub>，指第110页上第2个符号色中的反衬色。

八、本色谱文字说明采用中英文两种文字，分上、下两册装订。上册内容包括中黄、品红、青、黑叠色，共60页；下册包括地图专色叠色、地图连续色阶表、地图线划符号色和基本色简表，共54页。

九、参加本色谱制作的有：任源（电分、拷贝）；周永兴、杨福临，方虹、王小鹏、贾玉明、王辉（晒版、打样），刘本奇、乔军（印刷）。天津油墨厂提供了优质油墨。栾书俊参加监印，钟国良参加了打样试验，张清浦也给予了帮助，一并表示深切感谢。

1987年5月



## EXPLANATORY MANUAL

A. This Colour Chart has been developed primarily for the colour design and printing of maps especially thematic maps and atlases. In designing the Colour Chart, we have summarized colour design experience in Chinese maps and thematic atlases, also referred to the colour design characteristics of well-known foreign atlases.

This Colour Chart shows very rich assortment of colour samples, such as four-colour printing mixture system, familiar colour mixture system in thematic maps and atlases, a large number of map colour scale tables and basic colour of line and area symbols, all of which provide colour samples and a basis for the standardization and digitization in the technique of colour design and reproduction of maps. The Chart is not only an indispensable medium for map design and conditioning, picture processing and reproduction, map printing and quantity control, but also a valuable preparation for the setting up of colour data bank and realizing computer assisted design. Moreover, it is believed to be of great use to the research, education, art design and printing departments.

This Colour Chart is based on colourimetry and colour picture reproduction theory, characterized by the use of the standardized technique of reproduction, and aimed at the attainment of communication by best visual result. All the printed samples have been examined by the Institute of Measurement Science of China. The reproduced colour data have reached the CPC print standard of Heidelberg company in F.R.G..

The technique and materials in producing this Colour Chart are based on existing national condition, using of new technique of filmization, screenization and standardization. Which can be adopted by any factory given certain conditions.

B. This Colour Chart uses 14 basic colours, and 33432 colour pieces

made by combining these basic colours. It contains the four mixture colour systems below:

1. The two, three, or four superimposed colours are composed of yellow, magenta, cyan and black. Totalling 25395 colour types and covering 60 pages. These designs are based on the three-primary-colour principle and the colour picture reproduction technique, especially suitable for reference in reproducing satellite pictures, colour shades, various colour pictures, photos and works of fine art.

2. The two and three superimposed colour adapted from special colours total 7215 colour types, and cover 42 pages. These are designed primarily to meet the needs of thematic maps which are supposed to have high portray nature and special bright colouring. They are divided into two groups:

(1) Three combined colours of lemon, red and peacock: They have a total of 2067 colour types, and cover 12 pages. Using these combined systems, we can get comparatively bright orange groups (lemon mixed with red) and green groups (lemon mixed with peacock), for the improvement of colour visual effect in map appearance.

(2) Two combined colours made by superimposing orange, red-brown, green, purple, greenish blue, gray, with lemon, yellow, red, peacock, cyan colours, cover 30 pages, totalling 5148 colour types. They are produced to satisfy particular requirements of various thematic maps.

3. The map successive colour scale cover 7 pages, and consist of 85 various scales, and 822 colour types. Among these, (1)–(36) are designed for isoline maps; (37)–(74) primarily for chromatic maps; (75)–(85) for relief hypsometric maps. There are a considerable number of scales which have directly adopted colour specifications used successfully in well-known national and foreign maps (some have been revised); there are also many scales which are newly designed, so that a whole structure of successive colour scales and colour category can be obtained.

4. The colours of map lines and symbols cover 2 pages, totalling 128 types. While the major consideration is devoted to thematic maps, the colours of lines and symbols in topographic and general maps are also taken into account. Basically, they encompass nearly all the colours of lines and symbols frequently used in maps; the samples of line, point and area symbols

provided in this part of the Chart are for people to select from some of these colours are printed with monochromatic printing ink, and most of them are printed with different inks, superimposed with screens of different percentages to facilitate. In simultaneous printing of symbols and the rest of a map. In addition to positive colour symbols, there are negative colour symbols. The latter represent a new development in the use of symbol colours in thematic maps, as well as a good method to increase the content of thematic maps and to improve the visual effect of map surface.

C. This Colour Chart adopts square point screen. Colour and gray plates are divided into 13 screen classes: 3%, 5%, 10%, 15%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100%. The black plates are divided into 9 classes: 3%, 5%, 10%, 15%, 20%, 30%, 40%, 50%, and 60%. In the case of two superimposed colour system, the angles of screen are as follows: yellow (lemon) 90 degrees, magenta (red) 45 degrees, cyan (peacock) 15 degrees, black 75 degrees. Those for special two superimposed colours are 45 degrees and 15 degrees. Successive colour scales and the colour of lines and symbols are of 75 degrees, 45 degrees, 15 degrees.

D. This Colour Chart is printed on coated paper of 157 gm, with inks produced by the Tianjin Printing Ink Factory and by the model J2205 double colour press made in China. The density and chromaticity of the paper are shown in Table 1. The ink used was, whenever possible originally boxed ink. Some colours were mixed. The serial numbers of inks are as follows: yellow EXG-236 (8139), magenta EXG-135 (8239), cyan EXG-425 (8449), black 8729, lemon 8114, red 8224, peacock 8454, orange 3150, green 84-5-3 (map's green), brown 84-5-3 (contour's Brown); but red-brown purple, greenish blue, and gray were mixed.

E. In every step of producing the Colour Chart, a stringent quality testing was practised by using a DM-500 transmission densimeter, a DM-400 reflection densimeter and a FOGRA Pms signstrip. Principal technical parameters are as follows:

1. The error of screen percentage of positive copy is limited to  $\leq 2\%$ . This is appraised by Institute of Measurement Science of China.
2. The distinguish rate is achieved of 8 nm in positive P. S. plate.
3. For best solid density, print contrast, screen expansion rate of four



colour ink print, see Table 2.

4. For the solid density of special colour ink, see Table 3.

5. For grey balance curve, see Figure 1.

F. In the Colour Chart, all the chromaticity data for 14 basic colours are contained: tristimulus values,  $X$ ,  $Y$ ,  $Z$ ; Chromaticity coordinates,  $x$ ,  $y$ ; Uniform colour space coordinates,  $L^*$ ,  $a^*$ ,  $b^*$ ; Dominant wavelength  $\lambda$  (hue); Reflectance  $Y$  (Brightness) and Purity  $p_e$  (saturation). For particulars, see Table 4 and Figure 1, Figure 2, Figure 3. All the data have been tested by the Institute of Measurement Science of China.

G. For convenience in use and exchange, the basic colours of a combined used on a certain page are indicated on the left, the top and the upper left (on the right side of each successive colour scale, and the left side of the colours of lines and symbols) are indicated, and the percentage of screen given. Readers can easily find out the basic colour and its screen percentage of every combined peice. On the bottom of each page are attached the solid colour samples of basic colours used on that page for reference in proof and printing.

The coding methods of the present Colour Chart are: the number of the page (1—102) is combined with that of the colour on that page. For example: P12 · 125, means that the colour peice No. 125, is on page 12. If it is superimposed with black screen, then the percentage of black screen is to be added. For example: P26 · 12 · 15, means that on page 26, the No. 12 colour peice is superimposed with black screen of a percentage of 15.

The coding methods for successive colour scales are: the number of page plus the number of the successive colour scale (1—85) is combined with the number of square in the successive colour scale. Example: P103 · (8) · 1-7, means that on page 103, 1-7 squares are in the eighth colour scale table.

The coding method for the colour of lines and symbols are: the page number plus the number of lines and symbols (1—64) is linked up with the plus or minus sign (plus sign represents the positive image's colour, whereas the minus sign represents the negative image's colour). Example: P110 · ② \_ , means the second colour of lines and symbols on page 110 is the colour of negative image.

H. The explanations of this Colour Chart are written in Chinese and

English. In two volumes. The first volume contains yellow, magenta, cyan and black combined colours, and has 60 pages in all. The second volume includes special combined colours that are usually used in thematic maps, successive colour scales, the colour of lines and symbols, and basic colours, totalling 54 pages.

I. Participated in the work — Ren Yuan (filling is made by direct colour scanner, and copier); Zhou Yongxin and Yang Fuling; Fang Hong, Wang Xiaopong, Jia Yuming, Wang Hui (proof); Liu Bengi and Gao Jun (printing), and the Tianjin Printing Ink Factory, which offered the use of its superfine printing inks. Luan Shujun for his participation in the printing control. Zhong Guoliang for his work in proof testing. Zhang Qingpu for his assistance in the work. The authors wish to express their gratitude to these people.

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# 目 录

## Catalogue

### 一、中黄、品红、青、黑的二叠色、三叠色、四叠色

Two, three and four saperimposed colours of yellow, magenta, cyan and black

页 码 page	网 点 百 分 数 (%) Screen percentage			
	中 黄 (Y)	品 红 (M)	青 (C)	黑 (Bk)
1	3—100	3—100		
2	3—100		3—100	
3		3—100	3—100	
4	5	3—100	3—100	
5	10	3—100	3—100	
6	15	3—100	3—100	
7	20	3—100	3—100	
8	30	3—100	3—100	
9	40	3—100	3—100	
10	50	3—100	3—100	
11	60	3—100	3—100	
12	70	3—100	3—100	
13	80	3—100	3—100	
14	90	3—100	3—100	
15	100	3—100	3—100	
16	3—100	3—100		3 5 10
17	3—100	3—100		15 20 30
18	3—100	3—100		40 50 60
19	3—100		3—100	3 5 10
20	3—100		3—100	15 20 30
21	3—100		3—100	40 50 60
22		3—100	3—100	3 5 10
23		3—100	3—100	15 20 30
24		3—100	3—100	40 50 60
25	5	3—100	3—100	3 5 10
26	5	3—100	3—100	15 20 30
27	5	3—100	3—100	40 50 60
28	10	3—100	3—100	3 5 10