

Good Governance in Gem Business: Traceability of Origins and Tracking Alternative within a Certification Process

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Thailand is one of the World's Foremost Colored Stones Manufacturing and Trading Centres



Gemopolis, Bangkok



Gems Market, Chanthaburi



**Jewelry Fashion Center, Silom Rd.
Bangkok**



Objectives

- To support the colored stone business in the aspects of
 - consumers' confidence
 - corporate social responsibility
- To give our views for best practices in gem business on
 - the necessity of standardization in gem identification
 - origin traceability within a gem lab



Outline

- Good governance (nature, policy, transparency, responsibility)
- Best practices (competency & knowledge, capacity building, integrity, standardization)
- Traceability of stone origins (Ruby, Sapphire, Emerald, Alexandrite)
- Certification process
- Tracking alternatives
- Concluding remarks

From Mine to the Market

Raw material

Heating

Cutting

Grading

Selling



CHANTHABURI MINE



CHANTHABURI MARKET





KANCHANABURI



KANCHANABURI



KANCHANABURI



TANZANIA:WINZA



Stone pictures



MOZAMBIQUE



MOZAMBIQUE



BURMA

SRI LANKA

CAMBODIA





Ilakaka; Madagascar



Traceability

- **Traceability** refers to the completeness of the information about every step in a process chain
- **Traceability** is the ability to chronologically interrelate uniquely identifiable entities in a way that is verifiable
- **Traceability** is the ability to verify the history, location or application of an item by means of document & record identification

EXAMPLE

- **Sample A:** Ruby, Take in on 10th April 2010; Weight: 5.08 ct.
- Origin: East Africa
- No indications of Heating or **NTE** or **N**
- On 4th April 2011, Take in **Sample B**, Weight: 5.08 ct.
- Origin: East Africa
- **But**, With indications of Heating or **TE** or **H**





What do you think?



Good Governance in Gem Business

- **Tracking Alternative**

Sorting Input data

Stone Mapping

**Information
Technology**



Tracking Alternative: Sorting Input data (variety)

General_Customer_2011_New [Compatibility Mode] - Microsoft Excel

	A	B	C	D	E	L	M	N	O	P	Q	R	S	T
1	Issue No.	GIT No.	CUSTOMER				FORM	Colour	Weight	Test type	เลขที่ใบ รับรองผล	Time	DATE LEAVING	Qty
2			นิติบุคคล	บุคคลทั่วไป	ruby	Other								
142	15051	11.03.02.03714	KO (Thai)		ruby		loose	Red	7.46	memo	37333			1
146	15054	11.03.02.03718		ธนิษฐ พร้อมจักรสิงห์	ruby		loose	Pinkish red	3.03	memo	38527	32	10-Mar-11	1
147		11.03.02.03719		ธนิษฐ พร้อมจักรสิงห์	ruby		loose	Pinkish red	1.06	memo	37270	28		1
148		11.03.02.03720		ธนิษฐ พร้อมจักรสิงห์	ruby		loose	Red	1.09	memo	37288	20		1
149		11.03.02.03721		ธนิษฐ พร้อมจักรสิงห์	ruby		loose	Red	1.14	memo	37289	20		1
150		11.03.02.03722		ธนิษฐ พร้อมจักรสิงห์	ruby		loose	Pinkish red	1.05	memo	37287			1
151		11.03.02.03723		ธนิษฐ พร้อมจักรสิงห์	ruby		loose	Pinkish red	1.19	memo	37280			1
156	15059	11.03.03.03727	แพนด้า จิวเวลรี่		ruby		loose	Pinkish red	5.73	memo	38598	15	15-Mar-11	1
160		11.03.03.03729		พงษ์ศักดิ์ ภูมิขางค์ชัย	ruby		loose	Purplish red	3.21	report	13285			1
161	15063	11.03.03.03730	สระเกศ อินเตอร์		ruby		loose	Purplish red	7.13	memo	37421		1-Apr-11	1
162		11.03.03.03731	สระเกศ อินเตอร์		ruby		loose	Red	2.56	memo	37422			1
163		11.03.03.03732	สระเกศ อินเตอร์		ruby		loose	Purplish red	9.07	memo	37423			1
164		11.03.03.03733	สระเกศ อินเตอร์		ruby		loose	Pinkish red	5.38	memo	37424			1
165		11.03.03.03734	สระเกศ อินเตอร์		ruby		loose	Pinkish red	2.27	memo	37425			1
166		11.03.03.03735	สระเกศ อินเตอร์		ruby		loose	Pinkish red	4.07	memo	37426			1
167		11.03.03.03736	สระเกศ อินเตอร์		ruby		loose	Purplish red	3.43	memo	39521			1
168		11.03.03.03737	สระเกศ อินเตอร์		ruby		loose	Purplish red	12.55	memo	39522			1
169		11.03.03.03738	สระเกศ อินเตอร์		ruby		loose	Purplish red	7.66	memo	39523			1
170		11.03.03.03739	สระเกศ อินเตอร์		ruby		loose	Pinkish red	4.92	memo	39524			1
171		11.03.03.03740	สระเกศ อินเตอร์		ruby		loose	Red	7.04	memo	38924			1
172		11.03.03.03741	สระเกศ อินเตอร์		ruby		loose	Pinkish red	3.90	memo	38923			1
173		11.03.03.03742	สระเกศ อินเตอร์		ruby		loose	Red	3.77	memo	37456			1
174		11.03.03.03743	สระเกศ อินเตอร์		ruby		loose	Pinkish red	6.94	memo	37457			1
175		11.03.03.03744	สระเกศ อินเตอร์		ruby		loose	Red	5.39	memo	37458	28		1
176		11.03.03.03745	สระเกศ อินเตอร์		ruby		loose	Purplish red	2.54	memo	37459	30		1
177		11.03.03.03746	สระเกศ อินเตอร์		ruby		loose	Purplish red	10.50	memo	39539	23		1
178	15064	11.03.03.03747	สระเกศ อินเตอร์		rubv		loose	Red	7.06	memo	39562	37	5-Apr-11	1

Ready 595 of 1589 records found

Tracking Alternative: Sorting Input data (weight)

General_Customer_2011_New [Compatibility Mode] - Microsoft Excel

	A	B	C	D	E	J	K	L	M	N	O	P	Q	R
	Issue No.	GIT No.	CUSTOMER		VARIETY				FORM	Colour	Weight	Test type	เลขที่ใบ	Tim
28		11.03.01.04173		เฉลิมพล เลสูงเนิน					loose	Purple	5.30			
49		11.03.01.04194		เฉลิมพล เลสูงเนิน					loose	Purple	5.30			
55		11.03.01.04200		เฉลิมพล เลสูงเนิน					loose	Light blue	5.17			
74	15040	11.03.01.03646		กรรองแก้ว อรรถวิทย์			Spinel		loose	Pink	5.35	memo	37930	
164		11.03.03.03733	สระเกศ อันเดอร์		ruby				loose	Pinkish red	5.38	memo	37424	
175		11.03.03.03744	สระเกศ อันเดอร์		ruby				loose	Red	5.39	memo	37458	
182		11.03.03.03751	สระเกศ อันเดอร์		ruby				loose	Pinkish red	5.17	memo	39896	
188		11.03.03.03757	สระเกศ อันเดอร์		ruby				loose	Purplish red	5.24	memo	38993	
210		11.03.03.03779	สระเกศ อันเดอร์		ruby				loose	Purplish red	5.39	memo	37432	
214		11.03.03.03783	สระเกศ อันเดอร์		ruby				loose	Purplish red	5.38	memo	37436	
218		11.03.03.03787	สระเกศ อันเดอร์		ruby				loose	Purplish red	5.28	memo	39897	
222		11.03.03.03791	สระเกศ อันเดอร์		ruby				loose	Purplish red	5.31	memo	38949	
227	15070	11.03.04.C-1081		ปรีชา ผ่องเจริญกุล	ruby				loose	Pinkish red	5.30	memo	37924	
340	15103	11.03.07.03907		นิพัทธ์ โชคภิรมย์วงศ์					loose	Blue	5.37	memo	38585	
536		09.12.28.14520		บัญญัติ ประธานชัยมงคล	ruby				loose	Purplish red	5.24	memo	38718	
548	15165	11.03.14.04104	KO (Thai)		ruby				loose	Pinkish red	5.29	memo	38644	
549		11.03.14.04105	KO (Thai)		ruby				loose	Pinkish red	5.32	memo	38646	
580	15176	11.03.14.04135	BBJ				Cinnabar		loose	Red	5.16	memo	38652	
766	15232	11.03.17.04338	เฟชเช็ท เจมส์				Tourmaline		loose	Green	5.26	memo	38753	
981		11.03.21.04548	สุดาเดีย สโตนส์						loose	Light orange	5.23	memo	38861	
983		11.03.21.04550	สุดาเดีย สโตนส์						loose	Yellow	5.39	memo	37408	
1177		11.03.22.04744	แพนดอร่า โพรตักซ์				Rock Crystal		loose	Colourless	5.26	report	13026	
1275		11.03.24.04841	เฟชเช็ท เจมส์				Tourmaline		loose	Bluish green	5.34	memo	39762	
1277		11.03.24.04843	เฟชเช็ท เจมส์				Tourmaline		loose	Bluish green	5.32	memo	39763	
1326	15351	11.03.28.04892		สุทธิชัย รัตนเรือง					loose	Blue	5.25	memo	39975	
1463		11.03.29.05028		สุระ สุขประสิทธิ์					loose	Violetish blue	5.31	memo	39994	
1464		11.03.29.05029		สุระ สุขประสิทธิ์					loose	Purple	5.31	memo	39949	
1591														

Ready 27 of 1589 records found



Tracking Alternative: Sorting Input data (customer)

General_Customer_2011_New [Compatibility Mode] - Microsoft Excel

	A	B	C	D	E	M	N	O	P	Q	R	S	T	U	V	W
1	Issue No.	GIT No.	CUSTOMER	VAR	FOI	Colour	Weight	Test type	เลขที่	Tip	DATE	ราคา/หิน	ราคา			
5	15030	09.09.28.11338		สมชาย memo เปลี่ยน Cer	ruby	loose	Purplish red	0.85	report	13349		9-Mar-11	1			
6		10.11.22.18881		สมชาย memo เปลี่ยน Cer	ruby	loose	Red	1.13	report	13387			1			
7		10.03.25.04670		สมชาย memo เปลี่ยน Cer	ruby	loose	Pinkish red	1.01	report	13386			1			
8		10.09.20.12687		สมชาย memo เปลี่ยน Cer	ruby	loose	Red	0.79	report	13346			1			
9		10.10.20.13848		สมชาย memo เปลี่ยน Cer	ruby	loose	Red	1.20	report	13348			1			
14	15032	11.03.01.03592	อมร เจมส์			loose	Blue	2.97	report	13343	15	8-Mar-11	1			
15		11.03.01.03593	อมร เจมส์			loose	Blue	3.23	report	13344	15		1			
16		11.03.01.03594	อมร เจมส์			loose	Blue	2.72	report	13345	15		1			
17		11.03.01.03595	อมร เจมส์			loose	Blue	2.81	report	13342	15		1			
18	15033	11.03.01.03596	อมร เจมส์			loose	Yellowish green	14.97	report	13305		8-Mar-11	1			
19		11.03.01.03597	อมร เจมส์			loose	Blue	1.75	report	13298			1			
20		11.03.01.03598	อมร เจมส์			loose	Violetish blue	11.65	report	13299			1			
21		11.03.01.03599	อมร เจมส์			loose	Pink	8.63	report	13326			1			
22		11.03.01.03600	อมร เจมส์			loose	Yellow	33.41	report	13355			1			
23	15034	11.03.01.04168		เฉลิมพล เลสูงเนิน		loose	Violetish blue	10.67	report	13274		16-Mar-11	1			
56	15035	11.03.01.03628	Orawan Collection		ruby	loose	Red	2.12	report	13338		8-Mar-11	1	1,400	1,400	
71	15039	11.03.01.03643		สาธิต ทูลมณี	ruby	loose	Red	3.05	report		14	16-Mar-11	1	3,700*3	11,100	
72		11.03.01.03644		สาธิต ทูลมณี	ruby	loose	Purplish red	4.56	report	13282			1			
73		11.03.01.03645		สาธิต ทูลมณี	ruby	loose	Purplish red	4.37	report	13270			1			
97	15043	11.03.01.03669		David Acrit		loose	Yellow	4.28	report	13333		11-Mar-11	1			
98		11.03.01.03670		David Acrit		loose	Yellow	6.46	report	13332			1			
99		11.03.01.03671		David Acrit		loose	Blue	21.42	report	13331	19		1			
100		11.03.01.03672		David Acrit	ruby	loose	Pinkish red	16.72	report	13325	12		1			
101		11.03.01.03673		David Acrit	ruby	loose	Red	2.62	report	13313	19		1			
102		11.03.01.03674		David Acrit		loose	Yellow	6.13	report	13317			1			
103		11.03.01.03675		David Acrit		loose	Blue	6.99	report	13316	16		1			
104		11.03.01.03676		David Acrit	Star	loose	Pinkish red	11.18	report	13329	19		1			
105		11.03.01.03677		David Acrit		loose	Greenish blue	19.69	report	13321			1			
106		11.03.01.03678		David Acrit		loose	Green	2.02	report	13314			1			

Ready 270 of 1589 records found

The Gem and Jewelry Institute of Thailand (Public Organization)
The Gemmological Testing Laboratory of GIT is the official CGJO registered laboratory for Thailand

GEM IDENTIFICATION REPORT

Report No.:	11.04.20.05760	Date:	29 th April 2011
Sample Type:	1 cut stone	Weight:	2.15 ct
Cut:	Modified brilliant/Step	Dimensions:	8.39 x 7.14 x 4.16 mm
Shape:	Pear	Colour:	Pinkish red

Magnification: 1x

IDENTIFICATION RESULT

Species: NATURAL CORUNDUM

Variety: RUBY

Comment(s): No indications of heating

Instruments Used for Identification

[a] Refractometer	[d] Polariscope	[g] GC Fracture	[j] Microscope
[l] Visual Spec.	[m] UV-SPF-UV Lamp	[k] XRF (XFL/SL) Spec.	[n] FTIR Spec.
[i] UGM	[o] Laser Raman Spec.	[p] X-Rayography	[r] IHR
[t] Diamond Tester	[q] Diamond Vape	[s] LA-ICP-MS	[u] Others

Please see the back only for additional information

The original report with signature and the green paper tag/stamp is the only valid identification document

Thanong Lediwananuk

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Monrudee Thammawongjitt

B.Sc. (Gemology), FGA, CDG (HRD)

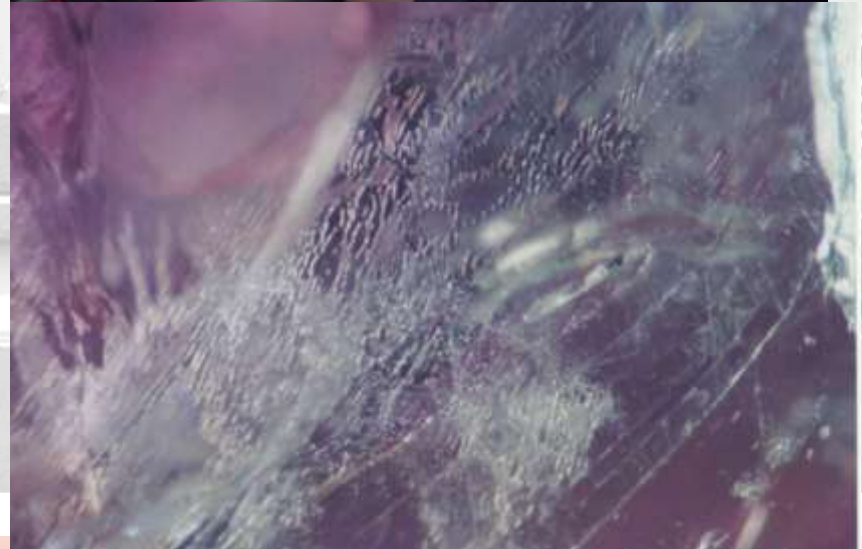
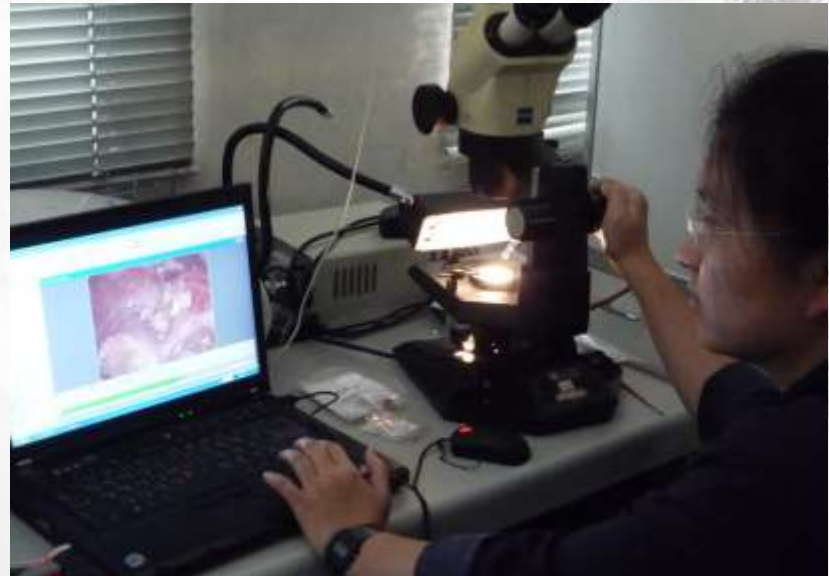
The Gem and Jewelry Institute of Thailand (Public Organization)
GIT is the National Institute for Testing, Research and Development of Gem and Jewelry

Technological Research and Testing Building

located at the Faculty of Science, Chulalongkorn University, Phrasaeng Road, Patumwan, Bangkok, 10330, Thailand
Tel.: 02-2554-3000 • Fax: 02-2554-3000 • Email: gem@git.or.th, gem@chula.ac.th, gem@git.or.th

GEM IDENTIFICATION WORKSHEET The Gem & Jewelry Institute of Thailand (Public Organization)		QIT No.: <u>11-02-30-23736</u> <input type="radio"/> Full Report <input type="radio"/> EMG <input type="radio"/> Mini Report <input type="radio"/> THA Client: <u>UPT Co., Ltd.</u>
PIECE DESCRIPTION: _____ Cut stone / _____ rough stone Jewelry Type: <u>Ring</u> <input checked="" type="checkbox"/> <u>Ox</u> <input type="checkbox"/> Pearl: _____ Loose or _____ Strand Others: _____ Weight: <u>2.15 g</u> <u>2.15 g</u> J/g / Kg DG: <u>0.000</u> Total Weight: _____ g / Kg Calculated Weight: _____ PF: _____ Dimensions: <u>8.39 x 9.14 x 4.16</u> mm/cm <input checked="" type="checkbox"/> Length of strand: _____ (strand only) Shape: _____ Cut: <u>Facet</u> <u>Plaid Brill</u> <u>ISAG</u> Colour: DL <u>BB PER</u> Transparency: <u>TD</u> Phenomenon: _____		IDENTIFICATION RESULT Species: <u>Natural Corundum</u> Variety: <u>Reddy</u> Gemstone(s): <u>No indications of heating</u>
REFRACTIVE INDEX RI Highest: <u>1.760</u> Lowest: <u>1.761</u> Max. Birefr.: <u>0.001</u> RI: _____ Disp. Reading: _____		GEMMOLOGIST: <u>AU</u> , <u>B</u> , <u>S</u> , <u>S</u>
OPTIC CHARACTER <input type="radio"/> BI <input checked="" type="radio"/> DR <input type="radio"/> ADR <input type="radio"/> AGO <input type="radio"/> GCS <input type="radio"/> SI <input type="radio"/> = <input type="radio"/> -		PLOTTING
PLECHROISM <input type="radio"/> Weak <input type="radio"/> Moderate <input type="radio"/> Strong Colour: _____		MICROSCOPIC DESCRIPTION <input checked="" type="radio"/> Crystal <input checked="" type="radio"/> Cloudlike particles <input checked="" type="radio"/> Needle / Silk <input checked="" type="radio"/> Tube <input checked="" type="radio"/> Fingerprint <input checked="" type="radio"/> Fracture texture <input type="radio"/> Growth line <input type="radio"/> Color band <input type="radio"/> Other features: _____
FLUORESCENCE LWAV: <input type="radio"/> Weak <input type="radio"/> Moderate <input checked="" type="radio"/> Strong Colour: <u>f.d</u> SWAV: <input type="radio"/> Weak <input type="radio"/> Moderate <input type="radio"/> Strong Colour: _____		IMMERSION TEST: _____
DIAMOND TESTER: _____ Pass _____ Not pass SPECTRUM 		ADVANCED TECHNIQUE TESTS <input checked="" type="radio"/> FTIR: <u>No peak at 3500 cm⁻¹</u> <input type="checkbox"/> Polymer Int.(B) <input type="checkbox"/> No polymer (A) (ZADE only) <input type="radio"/> EDXRF _____ <input type="radio"/> RAMAN _____ <input type="radio"/> UV/VIS-NIR _____ <input type="radio"/> X-Radiography _____ <input type="radio"/> OTHERS _____
ORIGIN DETERMINATION _____ Identical characters: _____ References: _____		
PHOTO FILE: _____		

Tracking Alternative: stone mapping



Good Governance in Gem Business

• Traceability of gemstone identification

Gemmological Data :

Physical ;

Weight, Dimensions, Shape/Cut, Color, Phenomena, Transparency , SG, inclusion plotting

Optical;

RI, Optical Character, Pleochoism, Spectrum

Others;

Fluorescence, Thermal conductivity, Advance spectroscopic data

Report no.



Good Governance in Gem Business

- Traceability of origin determination process

Gemmological Data



Data Base of chemical analysis for each deposit;
Thailand, Sri Lanka,
Madagascar, Tanzania,
Mozambique etc.



Report no.

Marble-Hosted Ruby of the Red River Fault Yen Bai, Vietnam



Note: Quality variation among
the same deposit



Good Governance in Gem Business

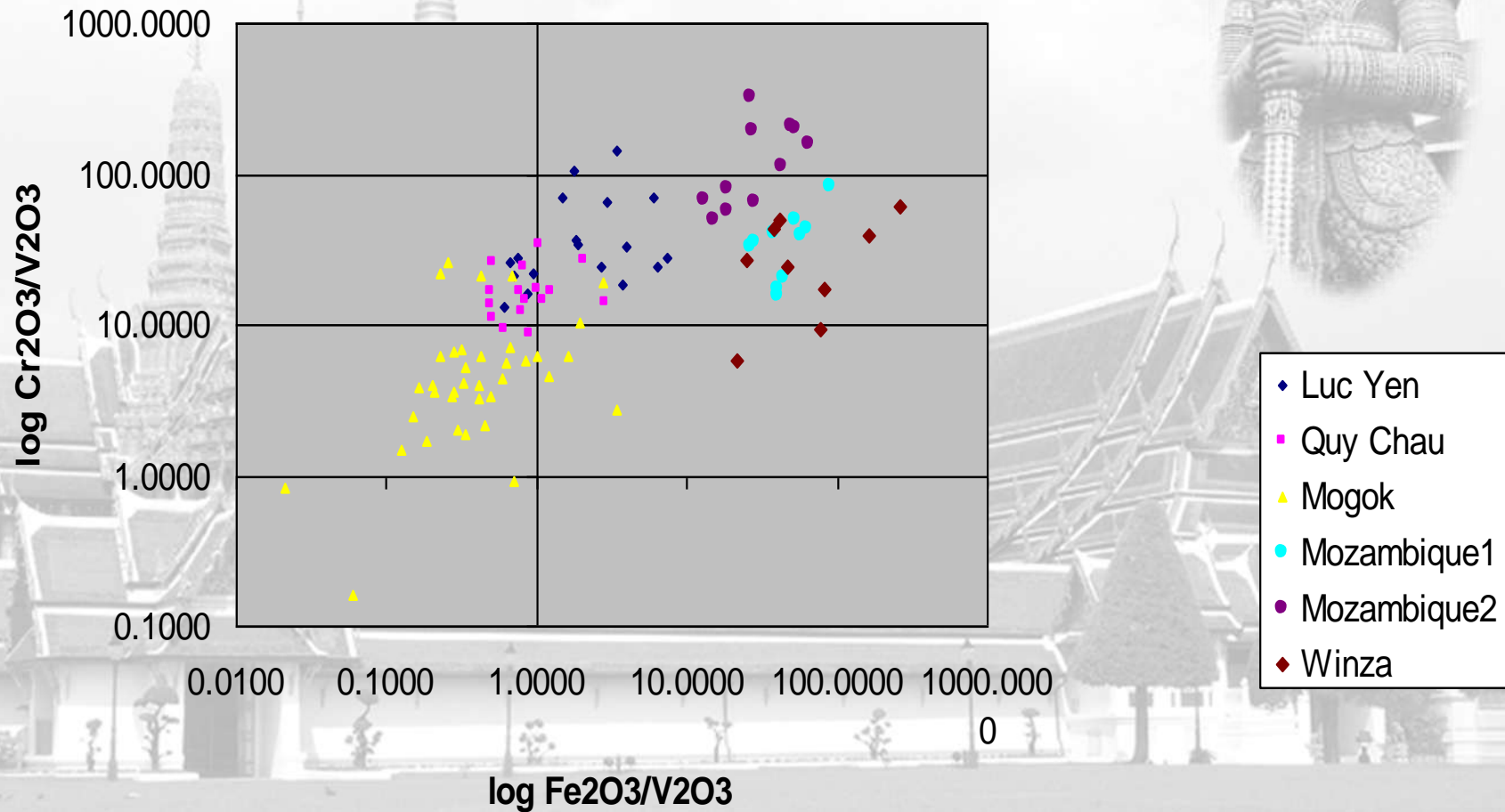
Advanced Instrumentation Techniques:

*Energy Dispersive X-ray Fluorescence
(EDXRF)*



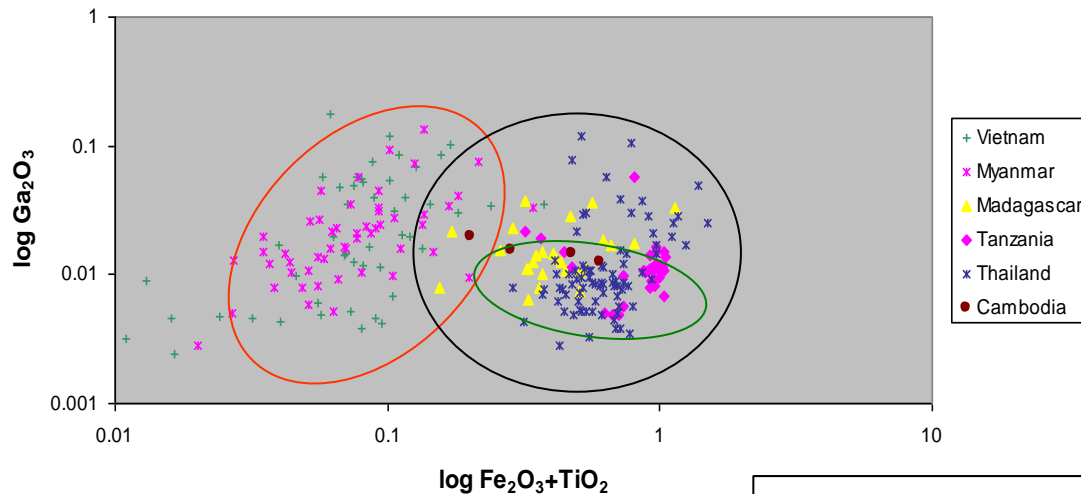
Origin Certification Process

Correlation diagram between ruby metamorphic



Origin Certification Process

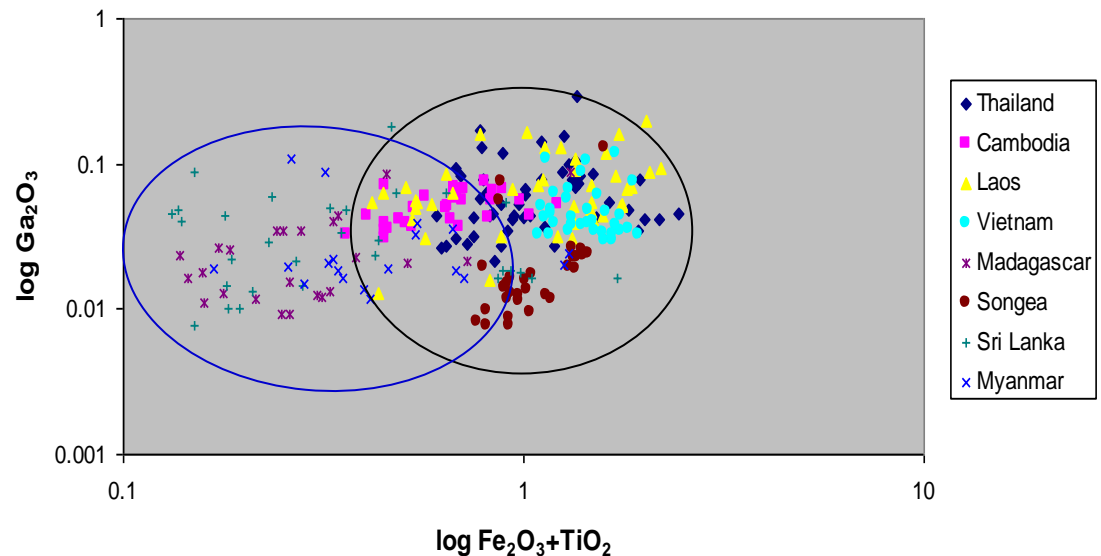
Correlation diagram between basaltic & metamorphic ruby



Plot of chemical analysis from different origins



Correlation diagram between basaltic & metamorphic blue sapphire



Basaltic

Metamorphic - marble

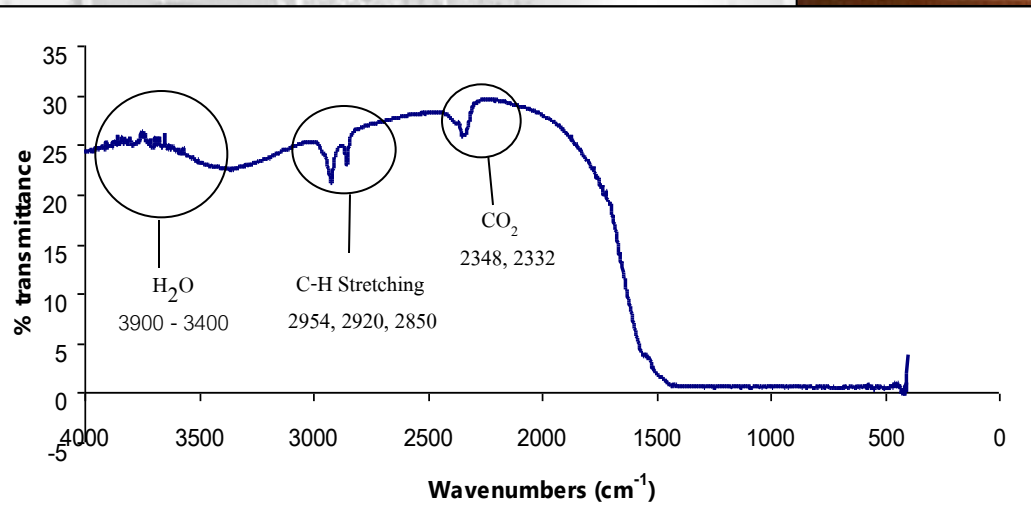
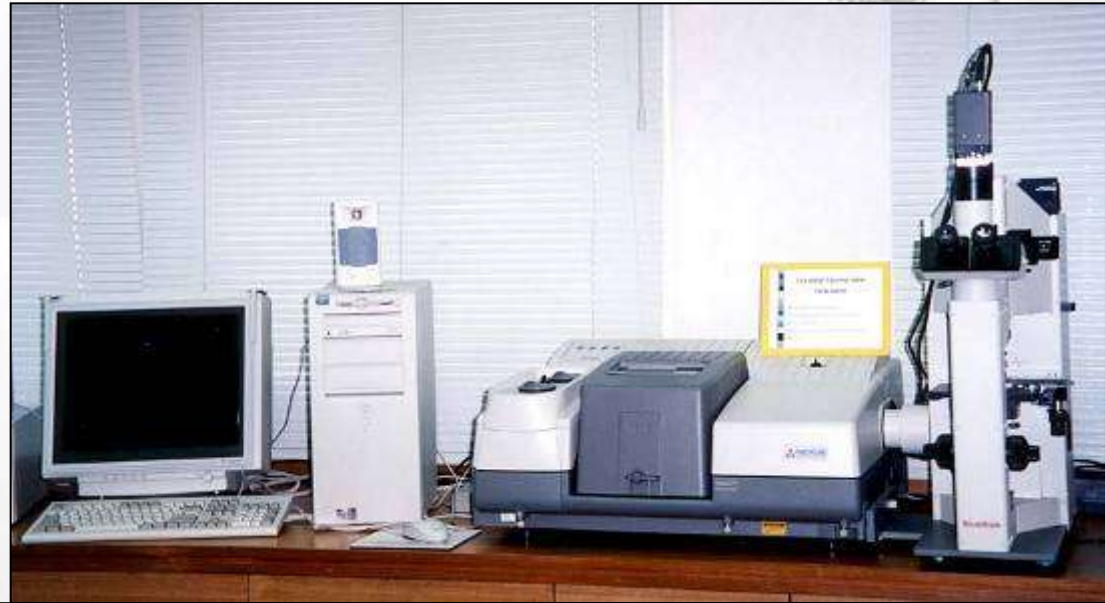
Metamorphic - Schist gneiss

Metamorphic



Origin Certification Process

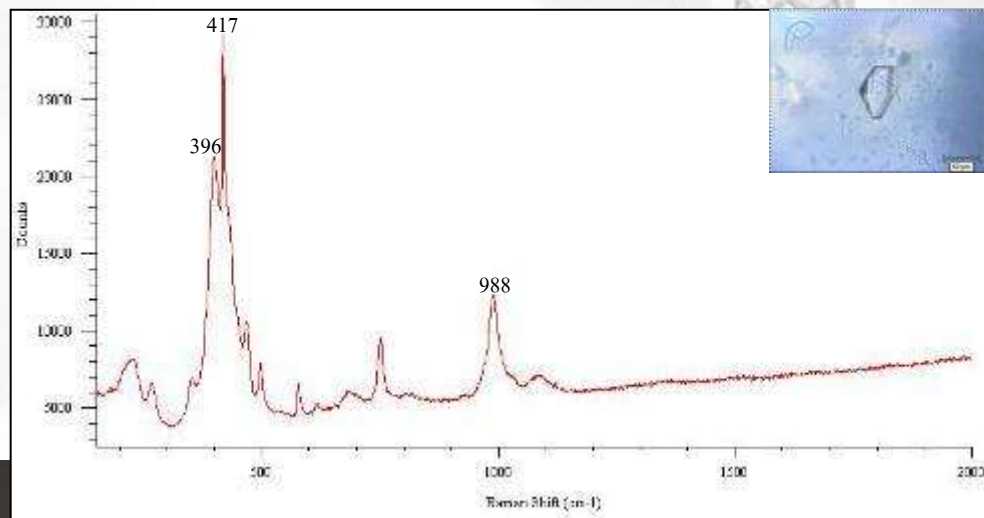
Fourier Transform Infrared (FTIR) Spectrometer



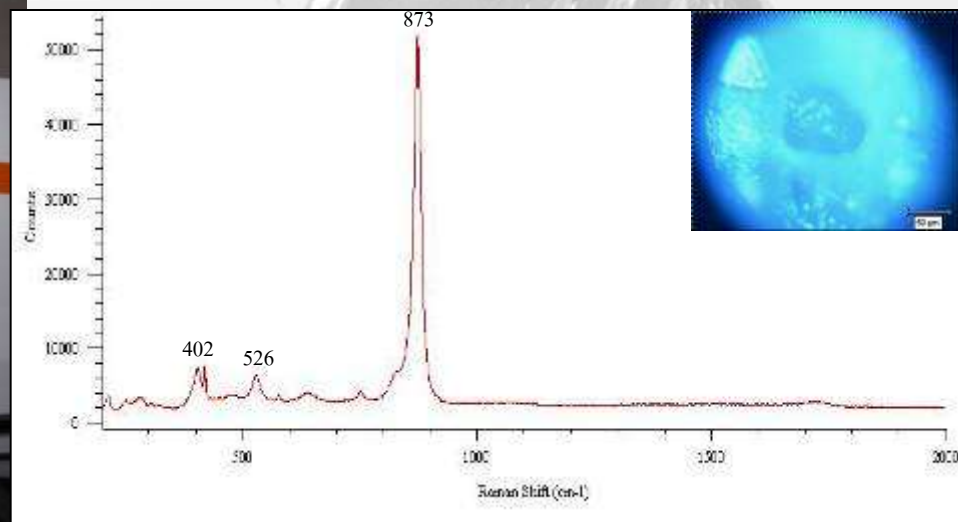
Blue sapphire, Tanzania

Origin Certification Process

Laser Raman Spectroscope



Nepheline in blue sapphire



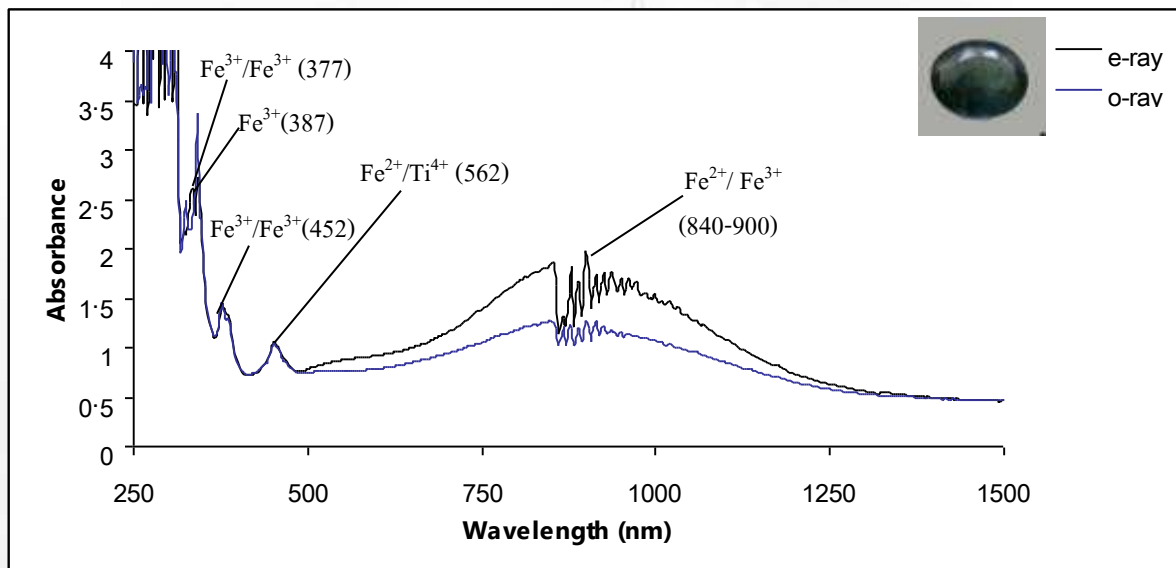
Columbite in blue sapphire

Origin Certification Process

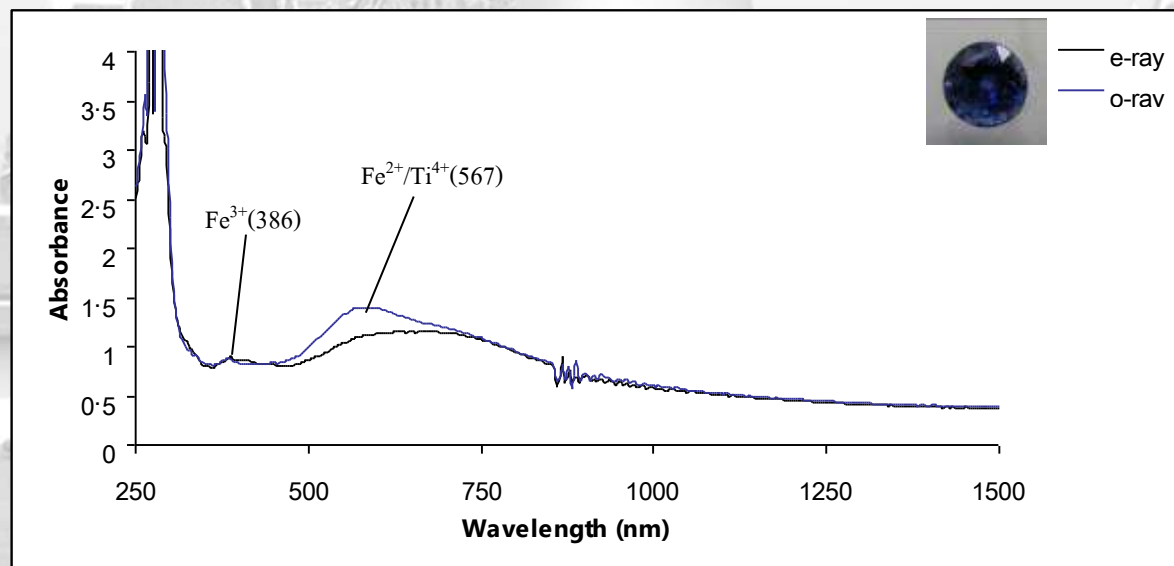
UV-VIS-NIR Spectrophotometer



Origin Certification Process



Basaltic Blue Sapphire, Thailand




Metamorphic Blue Sapphire from
Madagascar

Origin Certification Process

Laser Ablation ICPMS



Examples of GIT Origin Report

 The Gem and Jewelry Institute of Thailand (Public Organization)
The Gemological Testing Laboratory of GIT is the official CIBJO registered laboratory for Thailand


GEM IDENTIFICATION REPORT

Report No.: **SAMPLE** Date: **11th August 2008**

Sample Type: **1 cut stone** Weight: **3.20 ct**

Cut: **Brilliant/Step** Dimensions: **8.92 x 7.82 x 5.51 mm**

Shape: **Oval** Colour: **Red**



Magnification: 1x

IDENTIFICATION RESULT

Species: **NATURAL CORUNDUM**

Variety: **NATURAL RUBY**

Origin: Gemmological data indicate that the most probable geographic origin of this ruby is from **East Africa (Tanzania)**

Comment(s): **No indications of heating**

Instruments Used for Identification

[x] Refractometer	[x] Polaroscope	[x] SG Balance	[x] Microscope
[x] Visual Spec	[x] LW/SW UV Lamp	[x] UV/VIS/NIR Spec	[x] FTIR Spec
[x] EDRFP	[x] Laser Raman Spec	[x] R-Radiography	[x] LIBS
[x] Diamond Tester	[x] Calibrated Loupe	[x] Others	


Please see the back side for additional information.
The original report with signatures and the grand palace hologram is the only valid identification document.

SAMPLE

Thanong Ledawatansuk
M.Sc. (Geology), Graduate Gemologist (GIA)

Sureeporn Pumpeng
M.Sc. (Geology), FGA, CDG (HRD)

The Gem and Jewelry Institute of Thailand (Public Organization)
GIT is the National Institute for Testing, Research and Development of Gem and Jewelry
Gemological Research and Testing Building,
Located at the Faculty of Science, Chulalongkorn University, Phayathai Road, Bangkok 10330, Thailand
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 The Gem and Jewelry Institute of Thailand (Public Organization)
The Gemological Testing Laboratory of GIT is the official CIBJO registered laboratory for Thailand

GEM IDENTIFICATION REPORT

Report No.: **SAMPLE** Date: **19th December 2007**

Sample Type: **1 cut stone** Weight: **10.40 ct**

Cut: **Brilliant/Step** Dimensions: **13.00 x 11.82 x 7.60 mm**

Shape: **Oval** Colour: **Blue**



Magnification: 1x

IDENTIFICATION RESULT

Species: **NATURAL CORUNDUM**

Variety: **BLUE SAPPHIRE**

Origin: Gemmological data indicate that the most probable geographic origin of this blue sapphire is from **East Africa**

Comment(s): **Indications of heating**

Remark(s): Natural stones and supplies are commonly enhanced by heat to improve their colour and/or clarity, the results of which are stable and permanent.

Instruments Used for Identification

[x] Refractometer	[x] Polaroscope	[x] SG Balance	[x] Microscope
[x] Visual Spec	[x] LW/SW UV Lamp	[x] UV/VIS/NIR Spec	[x] FTIR Spec
[x] EDRFP	[x] Laser Raman Spec	[x] R-Radiography	[x] LIBS
[x] Diamond Tester	[x] Calibrated Loupe	[x] Others	

Please see the back side for additional information.
The original report with signatures and the grand palace hologram is the only valid identification document.

SAMPLE

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Tel : (662) 218-54700-3 Fax : (662) 218-54703 E-mail : jewelry@git.or.th / www.git.or.th

Good Governances

Gem institution/laboratory

- Nature or foundation; it can be a governmental office, public organization, association, partly authorized agency, share holding or private company.
- Examples: GIT, SSEF, CISGEM, GIA, CGL, GGL
- Being a member of LMHC leads a good governance in gem business

LMHC Members



The Gem and Jewelry
Institute of Thailand



GIA
GEMOLOGICAL INSTITUTE OF AMERICA®



SCHWEIZERISCHES GEMMOLOGISCHES INSTITUT
SWISS GEMMOLOGICAL INSTITUTE
INSTITUT SUISSE DE GEMMOLOGIE

Transparency

- The process of governance should be transparent / known to the public
- All the functions below should be clearly identified:
 - Source(s) of income, e.g., 100% government support, % public sharing, revenue/year
 - Executives & employees and their backgrounds
- The presence of Website, annual report, periodic publication, public communication

The Gem and Jewelry Institute of Thailand (GIT)

- Established by Thai government with co-operation of the Thai Gem and Jewelry Traders' Association in 1998
- 100% funded by Thai government
- A national institution in the form of public organization; governed by administration board (11 members, 5 from private sector)

GIT's services

- Gem/Pearl/Diamond testing (gem & treatment identifications, quality grading, geographic origin determination of –ruby/sapphire/emerald/alexandrite)
- **Information Centre**
- Training Center, Museum and Library
- **Research**
- Precious Metal Analysis


Standardization

- Personnel with good technical background
- Doing research
- Standard methodology of identification and techniques
- Database and IT
- Master stone sets (Pigeon's Blood, Royal Blue)
- International technical collaboration and training
- Association within trade and laboratory
- Standard services



GIT Gem Testing Laboratory



 The Gem and Jewelry Institute of Thailand (Public Organization)
The Gemological Testing Laboratory of GIT is the official CIBJO registered laboratory for Thailand

GEM IDENTIFICATION REPORT

Report No.: **SAMPLE** Date: 7th August 2007

Sample Type: **1 cut stone** Carat weight: **1.50 ct**

Cut: **Brilliant/Step** Colour notation: **Red**

Shape: **Oval** Clarity grade: **Good (Mrl)**

Dimensions: **7.29 x 5.45 x 4.17 mm** Cut grade: **Good**

Magnification 2x

IDENTIFICATION RESULT

Species: **NATURAL CORUNDUM**

Variety: **NATURAL RUBY**

Comment(s): **No indications of heating**

Instruments Used for Identification


[x] Refractometer	[x] Polariscope	[x] 3G Balance	[x] Microscope
[] Visual Spect.	[x] UV/IR UV Lamp	[] UV/VIS/NIR Spect.	[] FTIR Spect.
[] EDXRF	[] Laser Raman Spect.	[] X-Radiography	[] LIBS
[] Diamond Tester	[] Cathode Lumin.	[x] Others	

Please see the back side for additional information
The original report with signatures and the grand paper hologram is the only valid identification document.

SAMPLE

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 The Gem and Jewelry Institute of Thailand (Public Organization)
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 The Gem and Jewelry Institute of Thailand (Public Organization)
The official CIBJO (World Jewellery Confederation) laboratory for Thailand

GEM IDENTIFICATION CARD

GIT No.: **11.03.18.04360** Date: **24 March 2011**

RESULT: NATURAL RUBY

Shape, Cut: **Cushion, Brilliant/Step**

Weight: **1.68 ct** Colour: **Red**

Dimensions: **6.72 x 6.30 x 4.26 mm**

Comment(s): **No indications of heating**

Final photo

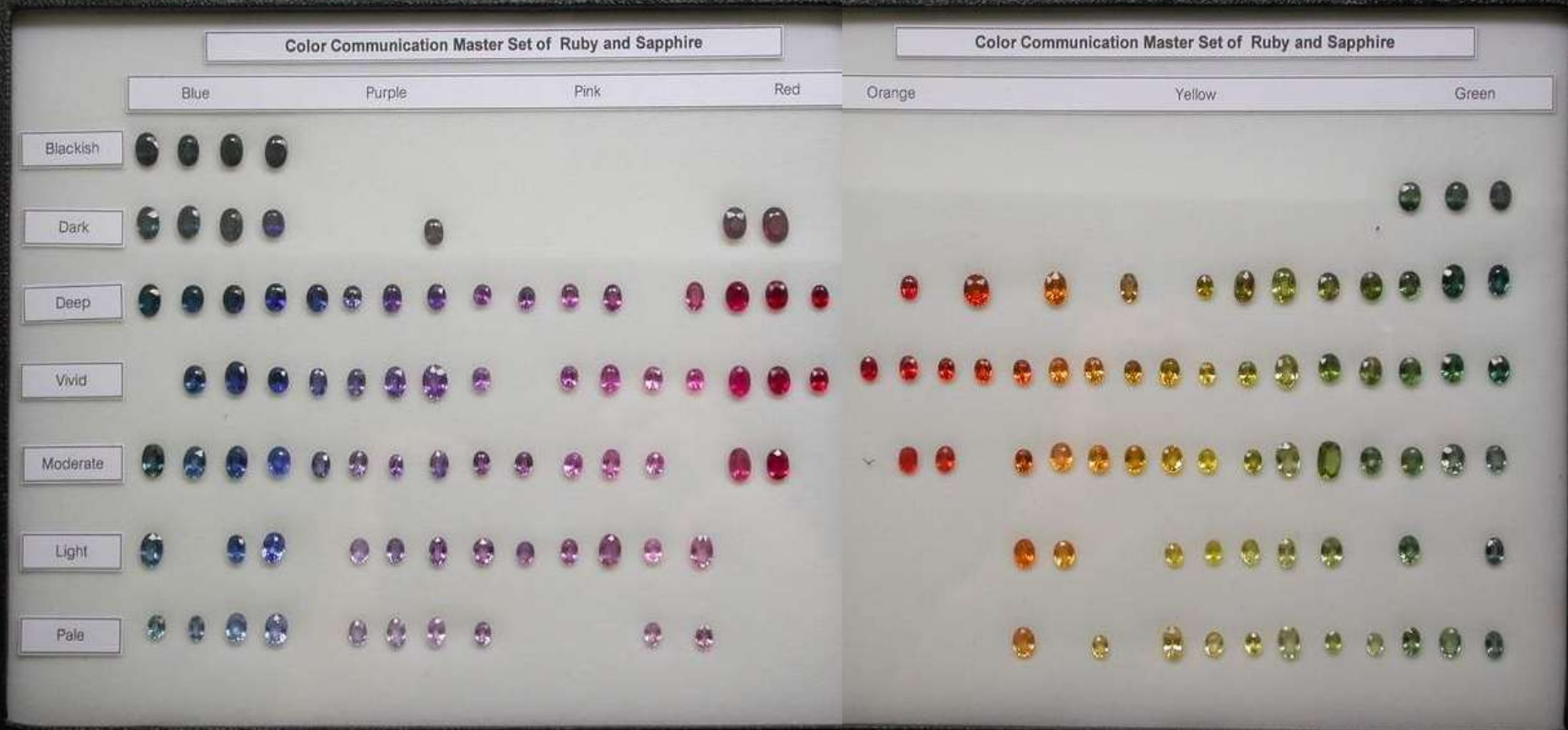
Examples of Research Achievements

- Colored stones' quality standards
- **Origin determinations (ruby/sapphire/emerald/alexandrite)**
- Heat treatment and its indication

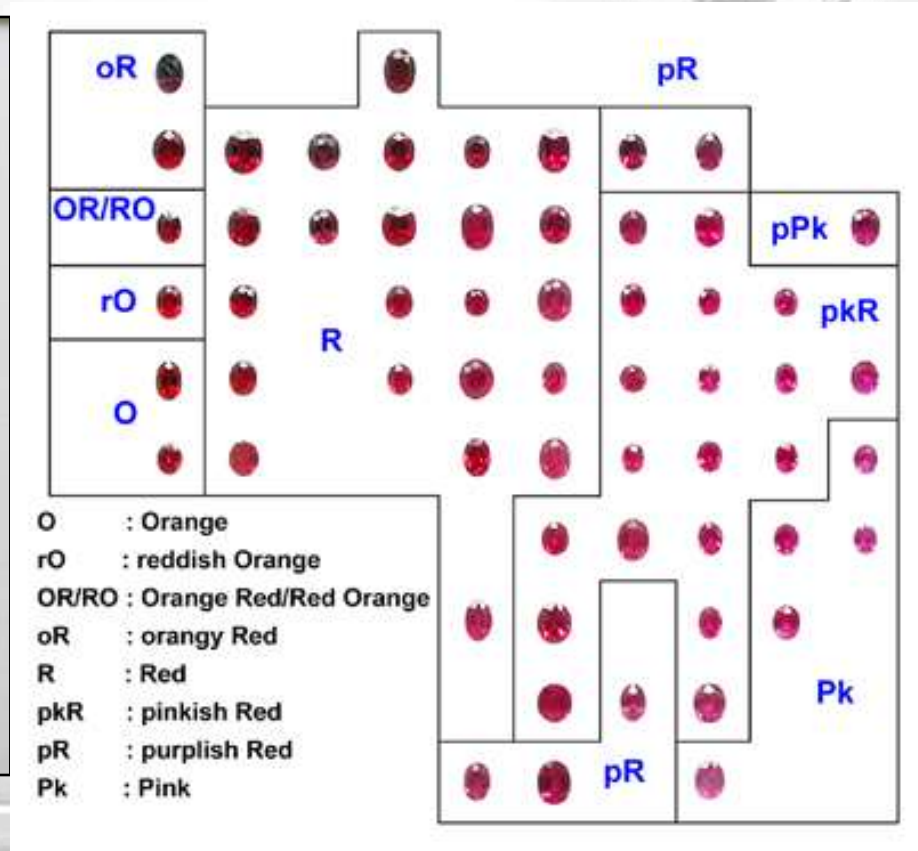
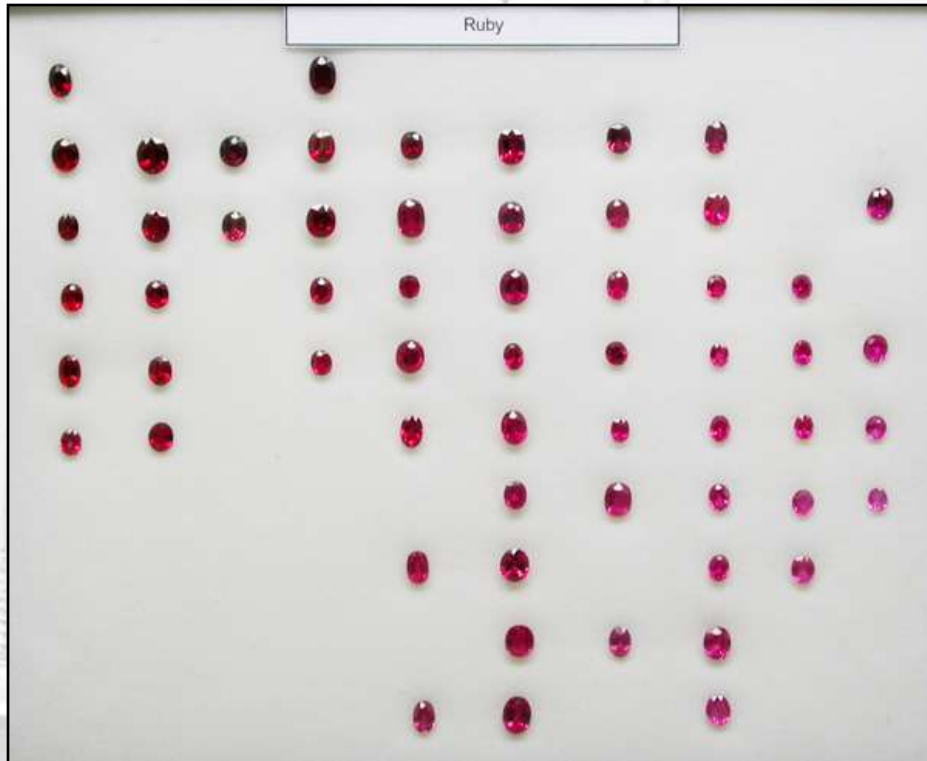


Heated at 800, 1000, 1200, 1400°C under oxidizing atmosphere

GIT's Colour Masters



Ruby Master Set



RUBY Master Sets



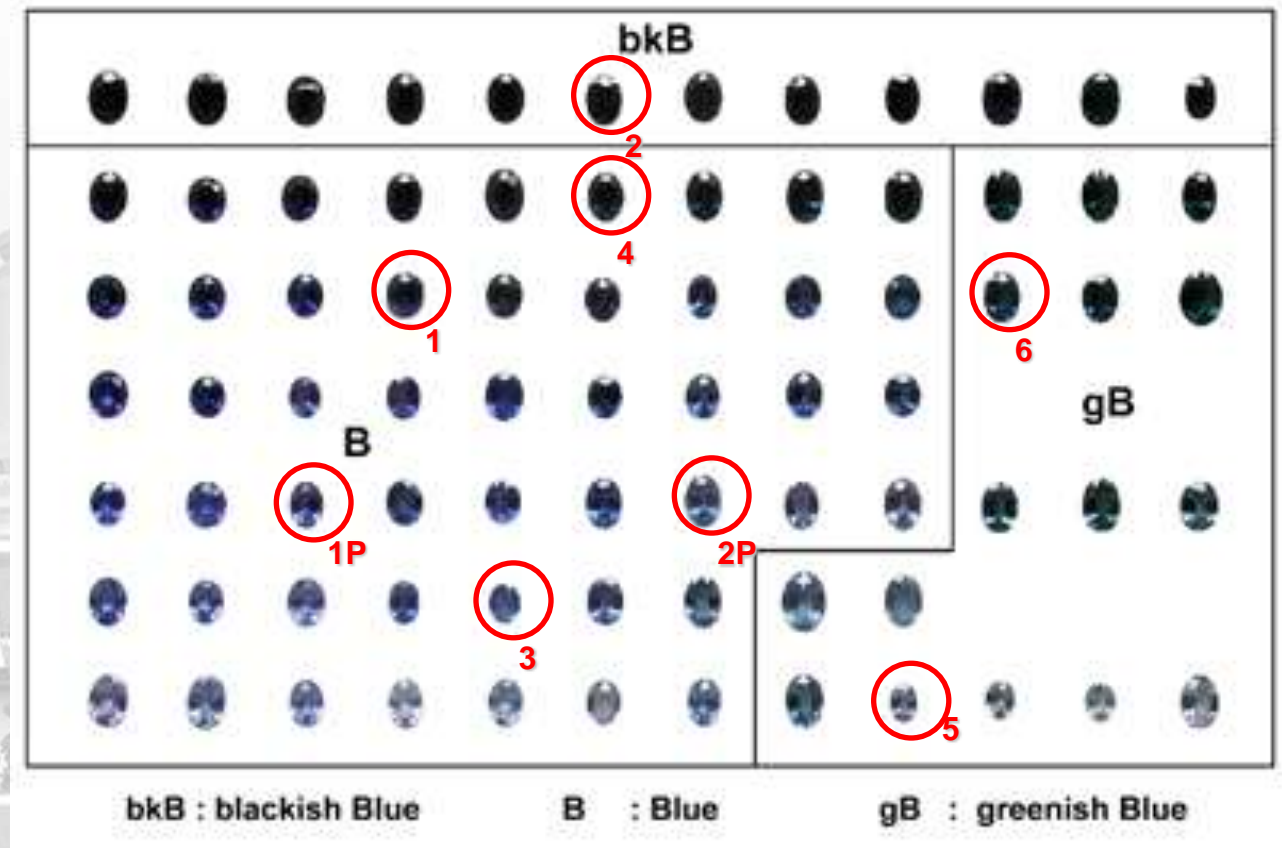
Blue Sapphire Master Set



Correlation of Trader's Master stones with GIT Master standards



Expert Gems Co., Ltd.



Research: Interview Traders and Colored Stone Experts

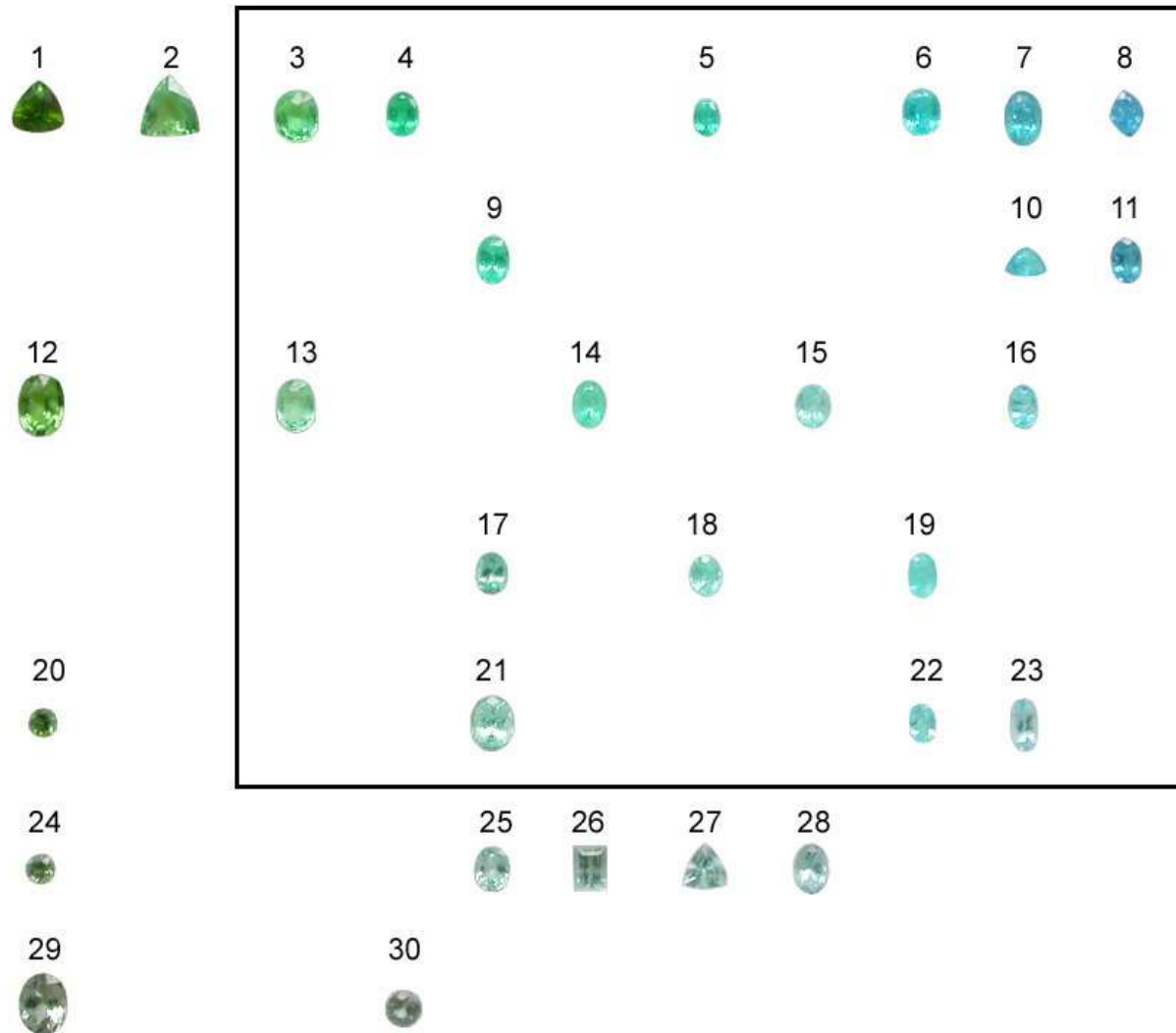


TCP group meeting to discuss on GIT's masters for Pigeon's blood ruby and Royal blue sapphire



Richard Hughes gave his comment on GIT's master for the color range of Padparadscha.

Paraiba Master Set



In 2009, GIT consulted and set up buying guides of ruby and sapphire to CIBJO.

Ruby Guide

12th April, 2008

The quality and value of a ruby depend on a combination of the following criteria:

CARAT

A ruby's weight is measured in carats. 5 carats = 1 gram.
All other criteria being equal, the greater the carat weight, the rarer the ruby and therefore greater its value. Illustrated below is the approximate appearance of a well cut oval shaped ruby for a given carat weight.

CUT

Shape
To optimize the natural rough, rubies are made in a wide variety of shapes such as those illustrated below.

Oval Cushion Octagon Pear Heart Square Round Marquise Trilliant Cabochon

Profile
Cut refers to the accuracy of the angles, proportions, symmetry and polish of the ruby. It greatly affects how light travels within the ruby, and how it exits in the form of brilliance.

Proportional Deep Shallow Asymmetrical

COLOUR

Colour is a matter of personal preference. Rubies vary in colour depending mainly upon their chromium and iron content. Therefore rubies from different countries* and mines have different predominant colours. Primarily red, rubies range from brownish and purplish shades to orangish and pinkish ones. But, a natural colour will always have a greater value than an equivalent colour obtained by heating or other processes.

* Main countries where rubies are mined: Afghanistan, Cambodia, India, Kenya, Madagascar, Myanmar (Burma), Pakistan, Sri Lanka (Ceylon), Tajikistan, Tanzania, Thailand (Siam), Vietnam

CLARITY

Inclusions
The clarity of a ruby is determined by the number, size and location of inclusions which are natural materials present in the stone. They reflect its fascinating geological aspects. Internally and externally too, there may be the presence of fissures, fractures and cavities which affect clarity.

Eye Clean Slightly Included Included

Transparency
Transparency refers to the ability of a ruby to transmit light. It is affected by the quantity or absence of opacity and brilliance present in the stone.

Opaque Translucent Transparent

FOR MORE INFORMATION REGARDING RUBY MODIFICATIONS, SYNTHETICS AND IMITATIONS REFER TO THE BACK.

Sapphire

The quality and value of a sapphire is dependant on a combination of the following criteria:

CARAT

A sapphire's weight is measured in carats. 5 carats = 1 gram.
All other criteria being equal, the greater the carat weight, the rarer the sapphire and therefore greater its value. Illustrated below is the approximate appearance of a well cut oval shaped sapphire for a given carat weight.

CUT

SHAPE AND CUT
To optimize the natural rough, sapphires are cut into a wide variety of shapes such as those illustrated below.

Oval Cushion Octagon Pear Heart Square Round Marquise Trilliant Cabochon

PROFILE
Cut refers to the accuracy of the angles, proportions, symmetry and polish of the sapphire. It greatly affects how light travels within the sapphire, and how it exits in the form of brilliance.

Proportional Deep Shallow Asymmetrical

COLOUR

Colour is a matter of personal preference. Sapphires vary in colour depending mainly upon their titanium and iron content. Therefore sapphires from different countries* and mines have different predominant colours. Primarily blue, sapphires range from dark and purplish shades to greenish and yellowish ones. But, a natural colour will always have a greater value than an equivalent colour obtained by heating or other processes.

* Main countries where sapphires are mined: Australia, Cambodia, Kenya, India (Kashmir), Madagascar, Myanmar (Burma), Nigeria, Pakistan, Tanzania, Thailand (Siam), Sri Lanka (Ceylon), USA (Montana).
Blue and purple are subject to aging and differences in heating techniques. Therefore these colours should not be used for colour references.

CLARITY

INCLUSIONS
The clarity of a sapphire is determined by the number, size and location of inclusions which are natural materials present in the stone. They reflect its fascinating geological aspects. Internally and externally too, there may be the presence of fissures, fractures and cavities which affect clarity.

Eye Clean Slightly Included Included

Transparency
Transparency refers to the ability of a sapphire to transmit light. It is affected by the quantity or absence of opacity and brilliance present in the stone.

Transparent Translucent Opaque

FOR MORE INFORMATION REGARDING SAPPHIRE MODIFICATIONS, SYNTHETICS AND IMITATIONS REFER TO THE BACK.

Use our master set to promote: Ruby Year 2006



ROMANCING RUBY



HAVE A SHINY SUCCESS IN RUBY YEAR 2006



The Gem and Jewelry Institute of Thailand

<http://www.git.or.th>

Best Practices within Certification Process

- Process of best practices should be implemented more effectively as an essential tool for good governance in gem business.
- Responsibility to consumers and the public in colored stone business including the related trade associations, gem laboratories, through all supply chain.

Tracking Alternatives within Certification Process

- **IT** for stone traceability (comparative database; variety, weight, shape, etc)
- **Gem sample database** and their properties (e.g. chemistry, spectroscopy, appearances)
- **Geographic origin** determination (through long term researches; ruby, sapphire, emerald, alexandrite)
- **Stone mapping** (inclusions, luminescence)

INTERNATIONAL (G&J) ORGANIZATIONS



THE WORLD JEWELLERY CONFEDERATION



International
Organization for
Standardization



Ethic and Accountability



ICA was founded in 1984
and is now comprised of over
600 gemstone dealers, cutters,
and miners from 47 countries

- a worldwide committee of industry organizations and gemological laboratories that meets on an annual basis.
- These meetings acknowledge that there are areas of misunderstanding and confusion within the gemstone industry concerning nomenclature and disclosure issues as they relate to laboratory reports and work towards the elimination of this confusion





Laboratory Manual Harmonisation Committee

Laboratory Manual Harmonisation Committee

LMHC

LMHC OFFICIAL WEBSITE

www.LMHC-gemology.org

Examples of the Information Sheets issued by the LMHC:



IS1:

“ Corundum with residues from the heating process present in healed fissures and/or cavities”

© 2004, The Laboratory Manual Harmonization Committee

LMHC Information Sheet # 1

Standardised Gemmological Report Wording (implementation beginning February, 2004)

Corundum with residue from the heating process present in healed fissures and/or cavities

Members of the Laboratory Manual Harmonization Committee (LMHC) have standardized the nomenclature that they use to describe heat treatment in corundum and the degree to which fissure 'healing' has occurred, and the residue that remains within the healed fissures and cavities, following the heating of corundum.

Healed fissures:

Any corundum that shows indications of heat treatment and a degree of healing along (previous) fractures - see Figure 1 - which also contain residue from the heating process, shall be described as « species » **'natural corundum'**, « variety » **'ruby'** or **'sapphire'** « comments » **'indications of heating'** (to modify the colour or transparency of the stone), plus the appropriate residue quantification terminology - **alpha numeric and/or text description**¹. See Table 1 and examples in figures 2a, 2b, 2c and 3.

Note 1: As an option, e.g., for "simplified reporting" situations, the quantification of residue in healed fissures may be replaced by the statement **'residue in healed fissures'**.

Note 2: wording in parenthesis is optional

Note 3: This clause may include the presence of **small filled cavities**.

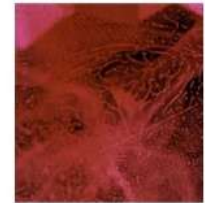
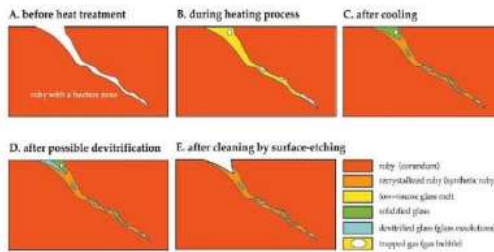


Figure 1: Flux assisted healing of a fracture during the heating process. A fracture that has been healed by the synthesis of corundum or other materials during the heat treatment or crystal growth processes. (Hänni, H.A., 1998) (a) schematic (b) actual

Table 1 Residue quantification terminology

Status →	No indications of heating	Indications of heating (no residue)	Indications of heating with residue in fissures				
Report Alpha numeric →	NTE	TE	TE1	TE2	TE3	TE4	TE5
Report Text →	No indications of heating	Indications of heating	Minor residue in fissures		Moderate residue in fissures		Significant residue in fissures
Wording in parenthesis optional			Indications of heating with residue in cavities				
			C1		C2		C3
			(Minor) Residue in cavities		(Moderate) Residue in cavities		(Significant) Residue in cavities

¹ In the cases of TE1 and TE2 (minor) or TE3 and TE4 (moderate), when the text version is selected a reference to the specific alpha-numeric shall be indicated either by combining the two or placing an « x » in the appropriate point of the comparative scale.

IS5

“Emerald-fissure filling/clarity enhancement”



Emerald – fissure filling/clarity enhancement

Members of the Laboratory Manual Harmonisation Committee (LMHC) have standardised the nomenclature that they use to describe an emerald.

Any emerald that has no fissures or does not show indications of having undergone modification through the filling of fissures with oils, resins, wax or any other filler shall be described as:

- Species: Natural beryl
- Variety: (Natural)¹ emerald
- Comments: None² or No fissure filling³ or No indications of clarity enhancement / modification⁴

Any emerald that shows indications of having undergone modification through the filling of fissures with near colourless oils, resins, wax or any other filler⁴ shall be described as:

- Species: Natural beryl
- Variety: Emerald
- Comments: Fissure filling or indications of clarity enhancement / modification, (plus the appropriate quantification terminology), (plus the identification of the filler). See table 1 for instructions concerning the use of the designated alpha numeric or text descriptions.

Table 1: Emerald, quantification and identification of filler in fissures

Status:	No fissures present in stone	No or insignificant filler in fissures ⁴	Quantification and identification of filler in fissures:		
Report Alpha numeric:			F1	F2	F3
Report Text:	None ²	No / insignificant fissure filling or No / insignificant indications of clarity enhancement / modification	Minor amount of oil / resin in fissures or Indications of minor clarity enhancement / modification	Moderate amount of oil / resin in fissures or Indications of moderate clarity enhancement / modification	Significant amount of oil / resin in fissures or Indications of significant clarity enhancement / modification

Note A: Opaque residues of resins or oils that remain behind within fissures following “cleaning” or through deterioration shall not be reported upon within the context of this IS. However, an informative note shall be placed on reports if opaque residues of resins or oils remain behind within fissures of emeralds through deterioration, e.g., drying or incomplete cleaning. An example of such a note would be: “(oil/resin) residues present”

Note B: The presence of materials within fissures that occur naturally is not within the context of this IS and need not be declared.

Note C: Whether using the alpha numeric or text description, the report shall also illustrate the equivalent by appending the above table or this Information Sheet shall be referenced.

¹ Text in parenthesis is optional.

² Only use if no fissures are observable.

³ Only use if fissures are observable.

⁴ When viewed in bulk, e.g., in a bottle, oils and resins may appear to have colour. However, when viewed in thin films, as in fissures, the appearance may be near colourless.



THE WORLD JEWELLERY CONFEDERATION

COLOURED STONE COMMISSION 2010-1

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THE WORLD JEWELLERY CONFEDERATION

CIBJO/SEC

THE GEMSTONE BOOK

Gemstones, Organic Substances & Artificial
Classification

(Including precious stones, gemstones, ornamental stones
information on their modifications, synthetic stones, artificial

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THE WORLD JEWELLERY CONFEDERATION

THE PEARL BOOK

Natural, Cultured & Imitation
(Including information on modifications)

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THE WORLD JEWELLERY CONFEDERATION

2010-1

2010-7-1

CIBJO / GEM MATERIALS 2010-1
CIBJO / SECTOR A / DIAMOND COMMISSION

THE DIAMOND BOOK

Diamonds — Terminology & Classification



The Gem and Jewelry Institute of Thailand

<http://www.git.or.th>

gemstone information manual

tenth edition

INDUSTRY INFORMATION GUIDE FOR
NATURAL GEMSTONES,
ENHANCED NATURAL GEMSTONES &
MAN-MADE STONES—
including care & handling recommendations



AGTA

AMERICAN GEM TRADE ASSOCIATION
THE AUTHORITY IN COLOR™



AGTA

AMERICAN GEM TRADE ASSOCIATION
THE AUTHORITY IN COLOR™

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Applications of Traceability within Certification

- A laboratory with good governance in issuing certificate should be beneficial to supply chain in gem business
- **Accountability in ethical mining and fair trade practices**
- The certification could be used as an essential tools in gem business

Country of Origin Certification of Colored Stones

PROS

- Increase the reliability and value of a gem in the trade
- Traceability of origin: benefit to trader and/or forensic
- Tracking alternative within a certification process: benefit to end consumers

CONS

- Not quite understanding to the end consumers
- Different opinions in origin determination among gem labs
- Can be used as a non tariff barrier in global business



Concluding Remarks

Good Governance in Gem Business:

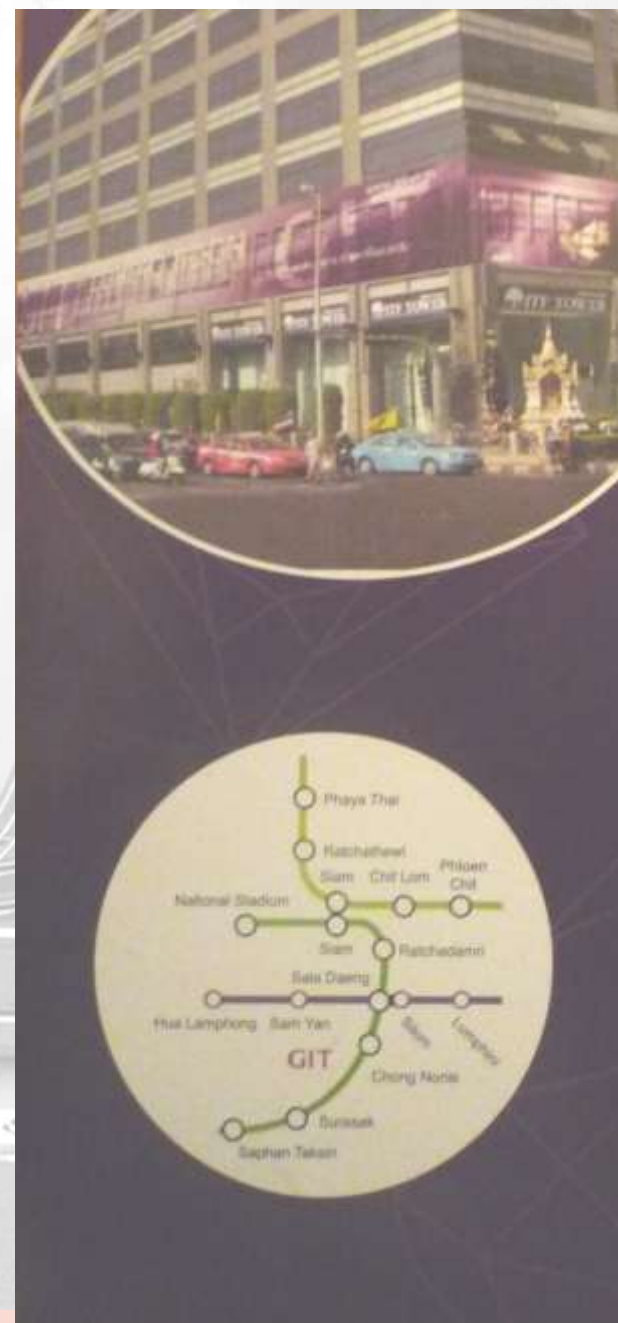
- Benefit to **both** traders and end consumers
- Issuing the certificate **with** ethic, integrity, and consistency
- Issuing reports on ones' needs, only an one man's own laboratory can do: **Good or bad governance?**





GIT 2012
 Challenging New Era of Gemological World
SAVE YOUR DATE
12.12.12

Conference:
 12 - 13 December 2012
Excursion:
 14 - 16 December 2012
Venue:
 Thailand and vicinity





Thank You

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