

## For Further Reading

GIA's course content comes from field research at gem mining, processing, and marketing centers, carried out by GIA subject matter experts and research scientists, as well as from publications on the GIA website and in GIA's peer-reviewed professional journal, *Gems & Gemology*, authored by GIA experts and worldwide contributors.

These references include source material for many of the course assignments and suggestions for your own research. You will not be tested on the information in any of the references provided below.



Scan the QR code above or go to <https://www.gia.edu/library> to access articles for further reading.

### Assignment 1: Introduction

*Gems & Gemology* current issue:  
<https://www.gia.edu/gems-gemology>

News and Articles:  
<https://www.gia.edu/gia-news-research>

GIA Gem Project:  
<https://www.gia.edu/gia-gem-database>

GIA Library recommended reading & bibliographies for gems and historical localities:  
<https://www.gia.edu/library>

### Assignment 2: Gemstone Formation and Mining

#### Gems from volcanic rocks

Thuyet N.T.M. et al. (2016) Peridot from the Central Highlands of Vietnam: Properties, Origin, and Formation. *Gems & Gemology*, Vol. 52, No. 3  
<https://www.gia.edu/gems-gemology/fall-2016-peridot-central-highlands-vietnam-properties-origin-formation>

Shigley J.E. et al. (2003) Red Beryl from Utah: A Review and Update. *Gems & Gemology*, Vol. 39, No. 4  
<https://www.gia.edu/gems-gemology/winter-2003-red-beryl-utah-shigley>

Levinson A.A., Cook F.A. (1994) Gem Corundum in Alkali Basalt: Origin and Occurrence. *Gems & Gemology*, Vol. 30, No. 4  
<https://www.gia.edu/gems-gemology/winter-1994-corundum-occurrence-levinson>

#### Gems from pegmatites

Proctor K. (1985) Gem Pegmatites of Minas Gerais, Brazil: The Tourmalines of the Governador Valadares District. *Gems & Gemology*, Vol. 21, No. 2  
<https://www.gia.edu/gems-gemology/summer-1985-tourmaline-brazil-proctor>

Shigley J.E., Kampf A.R. (1984) Gem-Bearing Pegmatites: A Review. *Gems & Gemology*, Vol. 20, No. 2  
<https://www.gia.edu/gems-gemology/summer-1984-pegmatite-shigley>

#### Gems from hydrothermal deposits

Keller P.C. (1983) The Capão Topaz Deposit, Ouro Preto, Minas Gerais, Brazil. *Gems & Gemology*, Vol. 19, No. 1  
<https://www.gia.edu/gems-gemology/spring-1983-topaz-brazil-keller>

### **Gems from metamorphic rocks**

Smith C.P. et al. (1997) Rubies and Fancy-Color Sapphires from Nepal. *Gems & Gemology*, Vol. 33, No. 1  
<https://www.gia.edu/gems-gemology/spring-1997-rubies-fancy-color-sapphire-nepal-smith>

### **Gems from sedimentary rocks**

Wise R.W. (1993) Queensland Boulder Opal. *Gems & Gemology*, Vol. 29, No. 1  
<https://www.gia.edu/gems-gemology/spring-1993-queensland-boulder-opal-wise>

### **Mining and Recovery**

Pardieu V., Vertriest W. (2016) Gem News International: Update on Colored Gemstone Mining in Tanzania. *Gems & Gemology*, Vol. 52, No. 3  
<https://www.gia.edu/gems-gemology/fall-2016-gemnews-update-colored-gemstone-mining-tanzania>

Visit Two of Mogok's Most Important Mines with GIA (2016) GIA Research & News  
<https://www.gia.edu/gia-news-research/field-gemologist-mogok-mines-dattaw-ruby-baw-mar-sapphire>

GIA Field Gemologists seek Ruby, Sapphire, and Spinel in Mogok, Myanmar (2015) GIA Research & News  
<https://www.gia.edu/gia-news-research/ruby-sapphire-spinel-mogok-myanmar-field-expedition>

On the Trail of Africa's Hidden Gems with GIA's Field Gemologists (2015) GIA Research & News  
<https://www.gia.edu/gia-news-research/trail-africa-hidden-gems-field-gemologists>

GIA Field Gemologists Seek Gems in Luc Yen, Vietnam (2015) GIA Research & News  
<https://www.gia.edu/gia-news-research/gems-luc-yen-vietnam-field-expedition>

Pay D. et al. (2015) An Overview of the 2014 GIA Brazil Expedition. GIA Research & News  
<https://www.gia.edu/gia-news-research-an-overview-of-2014-gia-brazil-expedition>

Long P.V. et al. (2013) Update on Gemstone Mining in Luc Yen, Vietnam. *Gems & Gemology*, Vol. 49, No. 4  
<https://www.gia.edu/gems-gemology/WN13-Long-Gemstone-Mining-Vietnam>

Shigley J.E. et al. (2010) Gem Localities of the 2000s. *Gems & Gemology*, Vol. 46, No. 3  
<https://www.gia.edu/gems-gemology/fall-2010-diamond-pearl-colored-stones-shigley>

Laurs B.M. (2004) Gem News International: Update on Several Gem Localities in Zambia and Malawi. *Gems & Gemology*, Vol. 40, No. 4  
<https://www.gia.edu/gems-gemology/winter-2004-gem-news-international>

Laurs B.M. (2002) Gem News International: Update on Some Namibian Gem Localities. *Gems & Gemology*, Vol. 38, No. 3  
<https://www.gia.edu/gems-gemology/fall-2002-gem-news-international>

Cook F.A. (1997) Applications of Geophysics in Gemstone Exploration. *Gems & Gemology*, Vol. 33, No. 1  
<https://www.gia.edu/gems-gemology/spring-1997-geology-techniques-cook>

Dirlam D. et al. (1992) Gem Wealth of Tanzania. *Gems & Gemology*, Vol. 28, No. 2  
<https://www.gia.edu/gems-gemology/summer-1992-tanzania-gems-dirlam>

### **Assignment 3: Gems and Their Physical Properties**

Raynaud V., Vertriest W. (2016) Micro-World: Etch Marks, Negative Crystals, and Etch Tubes in Spinel from Madagascar. *Gems & Gemology*, Vol. 52, No. 3  
<https://www.gia.edu/gems-gemology/fall-2016-microworld-etch-marks-negative-crystals-tubes-spinel-madagascar>

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<https://www.gia.edu/gems-gemology/fall-2016-microworld-tourmaline-termination>
- Sun Z., Moyal J. (2016) Gem News International: Large Aqueous Primary Fluid Inclusion in Amethyst. *Gems & Gemology*, Vol. 52, No. 3  
<https://www.gia.edu/gems-gemology/fall-2016-gemnews-large-aqueous-primary-fluid-inclusion-amethyst>
- Renfro N. (2016) Micro-World: Mobile Fluorite in Quartz. *Gems & Gemology*, Vol. 52, No. 3  
<https://www.gia.edu/gems-gemology/fall-2016-microworld-mobile-fluorite-quartz>
- Renfro N., Sun Z. (2016) Micro-World: Unusual Growth Zoning in Beryl. *Gems & Gemology*, Vol. 52, No. 3  
<https://www.gia.edu/gems-gemology/fall-2016-microworld-unusual-growth-zoning-beryl>
- Renfro N. et al. (2016) Micro-World: A Fantastic Display of Phase Changes in a Sapphire's Fluid Inclusion. *Gems & Gemology*, Vol. 52, No. 1  
<https://www.gia.edu/gems-gemology/spring-2016-microworld-fantastic-display-phase-changes-sapphires-fluid-inclusion>
- Skalwold E.A. et al. (2015) Introduction to the Micro-World of Gems. *Gems & Gemology*, Vol. 51, No. 2  
<https://www.gia.edu/gems-gemology/summer-2015-microworld-introduction-gems>
- Renfro N. et al. (2015) A Closer Look at the Micro-World of Gems. *Gems & Gemology*, Vol. 51, No. 2  
<https://www.gia.edu/gems-gemology/micro-world-gallery>
- Renfro N. et al. (2013) Lab Notes: Unusual Curved Color Zoning in Emerald. *Gems & Gemology*, Vol. 49, No. 2  
<https://www.gia.edu/gems-gemology/lab-notes-Unusual-Curved-Color-Zoning-In-Emerald>
- The Hidden Beauty of Gemstones (2013) GIA Research & News  
<https://www.gia.edu/photomicrography>
- Koivula J.I. et al. (2009) Solution-Generated Pink Color Surrounding Growth Tubes and Cracks in Blue to Blue-Green Copper-Bearing Tourmalines from Mozambique. *Gems & Gemology*, Vol. 45, No. 1  
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- Martin D.D. (1987) Gemstone Durability: Design to Display. *Gems & Gemology*, Vol. 23, No. 2  
<https://www.gia.edu/gems-gemology/summer-1987-gemstone-durability-martin>

## Assignment 4: Gems and Light

### Color-causing mechanisms

- Lu R. (2013) Lab Notes: Yellow Synthetic Sapphire Colored by Trapped-Hole Mechanism. *Gems & Gemology*, Vol. 49, No. 1  
<https://www.gia.edu/gems-gemology/spring-2013-labnotes-yellow-synthetic-sapphire>
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<https://www.gia.edu/gems-gemology/spring-2011-gem-news-international>
- Merkel P.B., Breeding C.M. (2009) Spectral Differentiation Between Copper and Iron Colorants in Gem Tourmalines. *Gems & Gemology*, Vol. 45, No. 2  
<https://www.gia.edu/gems-gemology/summer-2009-tourmalines-copper-merkel>
- Fritsch E., Rossman G.R. (1988) An Update on Color in Gems. Part 3: Colors Caused by Band Gaps and Physical Phenomena. *Gems & Gemology*, Vol. 24, No. 2  
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<https://www.gia.edu/gems-gemology/fall-1987-color-gems-fritsch>

### **Other optical properties**

Hughes R.W. (2014) Pleochroism in Faceted Gems: An Introduction. *Gems & Gemology*, Vol. 50, No. 3

<https://www.gia.edu/gems-gemology/fall-2014-introduction-pleochroism-faceted-gems>

Hurlbut C.S., Francis C.A. (1984) An Extraordinary Calcite Gemstone. *Gems & Gemology*, Vol. 20, No. 4

<https://www.gia.edu/gems-gemology/winter-1984-calcite-hurlbut>

### **Phenomena**

Bohannon S. (2016) Optical Effects of Phenomenal Cabochons. GIA Research & News

<https://www.gia.edu/gia-news-research/optical-effects-phenomenal-cabochons>

Schmetzer K. et al. (2015) Dual-Color Double Stars in Ruby, Sapphire, and Quartz: Cause and Historical Account. *Gems & Gemology*, Vol. 51, No. 2

<https://www.gia.edu/gems-gemology/summer-2015-dual-color-double-stars-ruby-sapphire-quartz>

Pay D. (2015) Gem News International: Color-Change Garnets from Tanzania. *Gems & Gemology*, Vol. 51, No. 1

<https://www.gia.edu/gems-gemology/spring-2015-gemnews-color-change-garnets-tanzania>

Hainschwang T., Notari F. (2006) The Cause of Iridescence in Rainbow Andradite from Nara, Japan. *Gems & Gemology*, Vol. 42, No. 4

<https://www.gia.edu/gems-gemology/winter-2006-iridescence-rainbow-andradite-japan-hainschwang>

Gübelin E., Schmetzer K. (1982) Gemstones with Alexandrite Effect. *Gems & Gemology*, Vol. 18, No. 4

<https://www.gia.edu/gems-gemology/winter-1982-alexandrite-effect-gubelin>

## **Assignment 5: Synthetics and Imitations**

### **Synthetic Corundum**

Saeseaw S. et al. (2015) Analysis of Synthetic Ruby Overgrowth on Corundum. GIA Research & News

<https://www.gia.edu/gia-news-research/synthetic-ruby-overgrowth-corundum-analysis>

Stone-Sundberg J. (2013) Sapphire Series Part 1: Introduction to Sapphire and Synthetic Sapphire. GIA Research & News

<https://www.gia.edu/gia-news-research-Sapphire-Series-Introduction-to-Sapphire-and-Synthetic-Sapphire>

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<https://www.gia.edu/gia-news-research-Sapphire-Series-Next-Generation-Growth-Techniques>

Stone-Sundberg J. (2013) Sapphire Series Part 3: Modern Synthetic Sapphire Applications. GIA Research & News

<https://www.gia.edu/gia-news-research-Sapphire-Series-Modern-Applications>

Stone-Sundberg J. (2013) Sapphire Series Part 4: Gem Synthetic Sapphire and Diffusion-Treated Synthetics. GIA Research & News

<https://www.gia.edu/gia-news-research-Sapphire-Series-Treated-Synthetics>

- Thomas V.G. et al. (1997) Tairus Hydrothermal Synthetic Sapphires Doped with Nickel and Chromium. *Gems & Gemology*, Vol. 33, No. 3  
<https://www.gia.edu/gems-gemology/fall-1997-hydrotherma-synthetic-sapphires-thomas>
- Koivula J.I., Kammerling R.C. (1988) A Gemological Look at Kyocera's New Synthetic Star Ruby. *Gems & Gemology*, Vol. 24, No. 4  
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<https://www.gia.edu/gems-gemology/spring-1985-synthesis-ruby-sapphire-kane>
- Kane R.E. (1983) The Ramaura Synthetic Ruby. *Gems & Gemology*, Vol. 19, No. 3  
<https://www.gia.edu/gems-gemology/fall-1983-synthetic-ruby-kane>
- Kane R.E. (1982) The Gemological Properties of Chatham Flux-Grown Synthetic Orange Sapphire and Synthetic Blue Sapphire. *Gems & Gemology*, Vol. 18, No. 3  
<https://www.gia.edu/gems-gemology/fall-1982-synthetic-sapphire-kane>
- Gübelin E.J. (1982) New Synthetic Rubies Made by Professor P. O. Knischka. *Gems & Gemology*, Vol. 18, No. 3  
<https://www.gia.edu/gems-gemology/fall-1982-synthetic-ruby-gubelin>

### **Synthetic Beryl**

- Schmetzer K. et al. (2016) Synthetic Emeralds Grown by Richard Nacken in the Mid-1920s. *Gems & Gemology*, Vol. 52, No. 4  
<https://www.gia.edu/gems-gemology/winter-2016-synthetic-emeralds-richard-nacken-1920s>
- Choudhary G., Golecha C. (2007) Gem News International: New Tairus Synthetic Beryl Simulating "Paraíba" Tourmaline. *Gems & Gemology*, Vol. 43, No. 4  
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- Koivula J.I. et al. (1996) Gemological Investigation of a New Type of Russian Hydrothermal Synthetic Emerald. *Gems & Gemology*, Vol. 32, No. 1  
<https://www.gia.edu/gems-gemology/spring-1996-hydrothermal-synthetic-emerald-koivula>
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<https://www.gia.edu/gems-gemology/fall-1985-synthetic-emerald-australia-kane>
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<https://www.gia.edu/gems-gemology/summer-1985-russia-synthetic-emerald-koivula>
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### **Synthetic Quartz**

- Balitsky V.S. et al. (1999) Russian Synthetic Ametrine. *Gems & Gemology*, Vol. 35, No. 2  
<https://www.gia.edu/gems-gemology/summer-1999-russian-synthetic-ametrine-balitsky>
- Balitsky V.S. et al. (1998) Russian Synthetic Pink Quartz. *Gems & Gemology*, Vol. 34, No. 1  
<https://www.gia.edu/gems-gemology/spring-1998-russian-synthetic-pink-quartz-balitsky>

Crowningshield R. et al. (1986) A Simple Procedure to Separate Natural from Synthetic Amethyst on the Basis of Twinning. *Gems & Gemology*, Vol. 22, No. 3

<https://www.gia.edu/gems-gemology/fall-1986-amethyst-twinning-crowningshield>

### **Synthetic Opal**

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Choudhary G., Bhandari R. (2008) A New Type of Synthetic Fire Opal: Mexifire. *Gems & Gemology*, Vol. 44, No. 3

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### **Other**

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<https://www.gia.edu/gems-gemology/winter-2010-synthetic-diamonds-renfro>

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<https://www.gia.edu/gems-gemology/fall-1987-malachite-russia-balitsky>

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<https://www.gia.edu/gems-gemology/fall-1987-alexandrite-inamori-created-kane>

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<https://www.gia.edu/gems-gemology/spring-1987-synthetic-jadeite-nassau>

### **Imitations**

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<https://www.gia.edu/gems-gemology/winter-2015-gemnews-golden-coral-imitated-plastic>

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- Fritsch E. (2003) Gem News International: Chatoyant Glass Cabochons from China. *Gems & Gemology*, Vol. 39, No. 4  
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## For Further Reading

GIA's course content comes from field research at gem mining, processing, and marketing centers, carried out by GIA subject matter experts and research scientists, as well as from publications on the GIA website and in GIA's peer-reviewed professional journal, *Gems & Gemology*, authored by GIA experts and worldwide contributors.

These references include source material for many of the course assignments and suggestions for your own research. You will not be tested on the information in any of the references provided below.



Scan the QR code above or go to <https://www.gia.edu/library> to access articles for further reading.

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## **Assignment 11: Carat Weight and the Gem Business**

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## For Further Reading

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### Assignment 12: Ruby

#### Africa

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## For Further Reading

GIA's course content comes from field research at gem mining, processing, and marketing centers, carried out by GIA subject matter experts and research scientists, as well as from publications on the GIA website and in GIA's peer-reviewed professional journal, *Gems & Gemology*, authored by GIA experts and worldwide contributors.

These references include source material for many of the course assignments and suggestions for your own research. You will not be tested on the information in any of the references provided below.



Scan the QR code above or go to <https://www.gia.edu/library> to access articles for further reading.

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## For Further Reading

GIA's course content comes from field research at gem mining, processing, and marketing centers, carried out by GIA subject matter experts and research scientists, as well as from publications on the GIA website and in GIA's peer-reviewed professional journal, *Gems & Gemology*, authored by GIA experts and worldwide contributors.

These references include source material for many of the course assignments and suggestions for your own research. You will not be tested on the information in any of the references provided below.



Scan the QR code above or go to <https://www.gia.edu/library> to access articles for further reading.

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