

## Andesine: Timeline of a Controversy

by Richard W. Hughes

1 August, 2011

### Abstract

This article provides a chronological timeline for the controversy surrounding treated andesine feldspar. In addition, common questions regarding the controversy are addressed. An extensive bibliography is provided at the end.

*Who was it telling me honestly honesty is all about the timing...  
Oh, my bad, there was I sitting here thinking that honesty was all about the truth...  
Oh, woe is me... with your honesty...*

*Fink, Honesty*

### 2001

Following ten years of research, a Chinese professor from Xi'an allegedly develops a process to successfully treat pale feldspar and turn it into more valuable red gems. Thus begins what would prove to be a massive fraud, as diffusion-treated material is sold as being untreated (Lang, 2002; Furuya, 2008).

### 2002

Red "Congolese" plagioclase feldspar first appears on the market (Fritsch, 2002).

### 20 September, 2002

Two men reportedly steal 23 notebooks containing details on a feldspar treatment process from a professor in Xi'an (see box: [Bickering Thieves Arrested After Stealing Professor's Data](#); Lang, 2002; Furuya, 2008).

### February, 2005

At the 2005 Tucson show, a dealer friend of Richard Hughes, Dana Schorr, asks if Hughes knows anything about the idea that "Congo" andesine might be treated. This was the first Hughes had heard the possibility mentioned and had no information one way or the other. Schorr was working with Oregon sunstone miners, John Woodmark and Bruce Moore (of Desert Sun Mining & Gems).

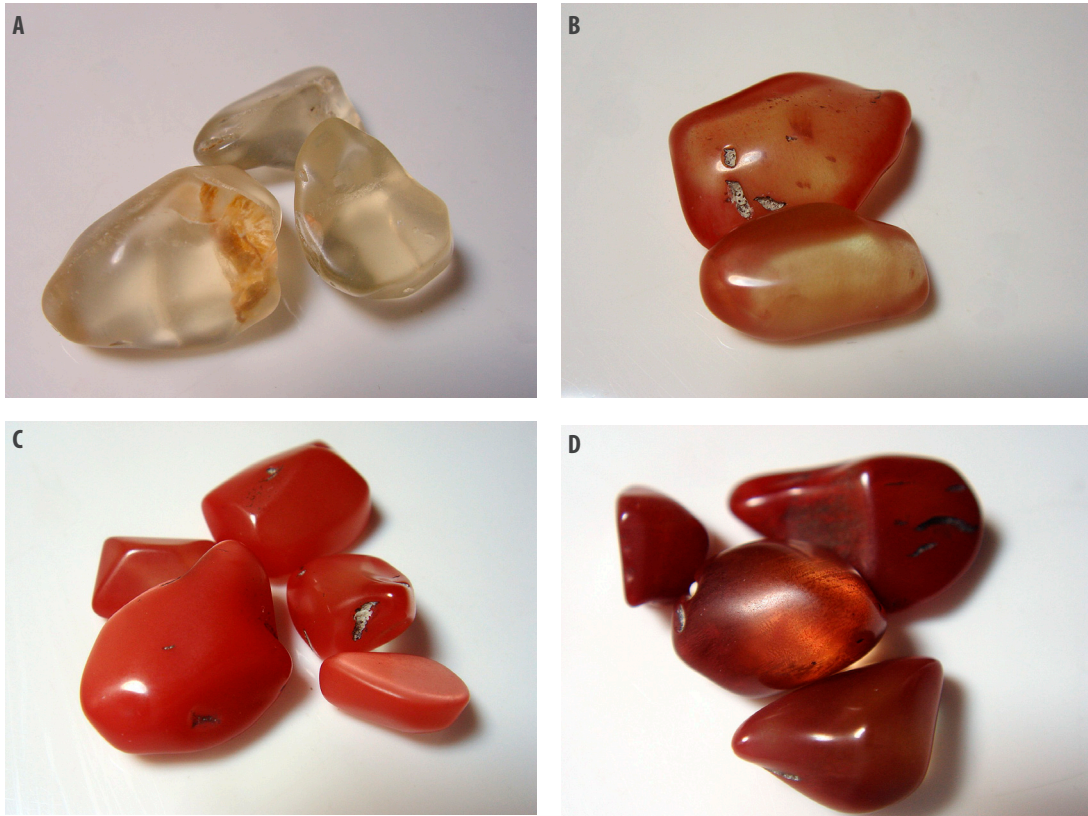
### October, 2005

In October 2005, a Chinese woman named Jackie Li of Do Win Development Co. Ltd. (Tianjin, China) provides the Gemological Institute of America (GIA) with a red andesine sample called "Tibetan sunstone." The gem reportedly came from Nyima (Nyemo) in central Tibet (Laurs, 2005).



**Figure 1.** Sample of treated andesine obtained by JGGL from China in 2006. Left: Rough specimen. Right: Wafer polished from the piece at left. Photos courtesy of Masaki Furuya/JGGL





**Figure 2.** Samples of andesine treated by a foreign treater in Bangkok. Clockwise from upper left: A: Untreated tumbled rough from Inner Mongolia. B–D: Stones after one, two and three months of treatment. Photos courtesy of Masaki Furuya/JGGL

## 2006

At the 2006 Tucson show, Schorr introduces Hughes to Jackie Li, who displays a large pile (several kilos) of what she says is Tibetan sunstone. She gives Schorr and Hughes once piece each. Hughes questions her about the exact locality and it becomes clear she has not actually visited the “mine” (Hughes, 2010). Back in the American Gem Trade Association Gemological Testing Center (AGTA GTC) lab, Hughes checks each piece, but finds nothing suspicious. Indeed, in immersion the rim of each stone is decolorized, which in the knowledge of that day was entirely different than what one would expect to find with a diffused gem.

## 2006

The Japan German Gemmological Laboratory (JGGL) obtains a specimen (Figure 1) of treated andesine from China, but believes at the time that the treatment is just experimental. Later, in February 2008, Ahmadjan Abduriyim of Japan’s Gemmological Association of All Japan (GAAJ)-ZENHOKYO laboratory polished the piece into a wafer, revealing a thin, colorless rim, surrounding a thin red circle, which in turn surrounds a much lighter core (Masaki Furuya, personal communication, 7 March, 2011).

## Late 2007

JGGL learns from Christina Iu (MP Gems, Kobe, Japan) that there is both a red andesine mine in Tibet and a commercially treated stone. They contact a Bangkok-based treater regarding the treated stone.

## January 2008

JGGL obtains samples of multistage treated andesine from a Bangkok-based treater and at this point realize the treatment previously observed from China did have potential for full penetration of copper throughout a specimen. The Bangkok-based treater told JGGL he used to perform the treatment, but the results were poor and the treatment was too costly, so he quit. Furuya’s photos show andesine in various stages of treatment, getting progressively darker as copper is diffused into the stone (Figure 2). (Masaki Furuya, personal communications, 7 March, 2 April, 2011)

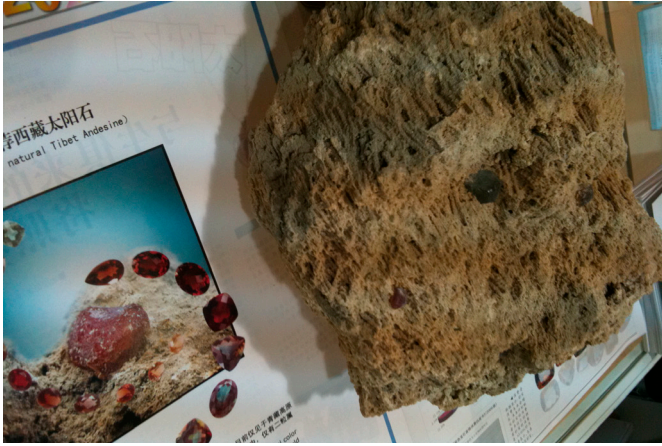
## Early February, 2008—Tucson Show

JGGL meets with Chris Rose of Oregon’s Spectrum Sunstone Mine and discusses the discoveries that JGGL has made regarding treated andesine (Masaki Furuya, personal communication, 2 April, 2011).

## 10 February, 2008—Tucson Show

Jewelry Television (JTV), one of the biggest sellers of andesine, states on their blog that the red and green andesine they have been selling is actually treated material from Mongolia. This is before anyone had demonstrated real evidence of the treatment. JTV produces a video of their TV personality, “Jewel Hunter Jack”, visiting mines in Inner Mongolia. JTV’s Jerry Sisk stated that in late 2007 “Our man in the field saw the rough coming out of the ground (all yellow) and was given the ‘recipe’ for heating the material.” (Roskin, 2008c).





**Figure 3.** Left: Andesine specimen in “matrix” spotted by Richard Hughes at the 2009 Hong Kong Jewellery Show. Photo: Richard W. Hughes Right: Many of the crystals in this specimen displayed suspicious shiny material at the junction between the rock and the andesine. The GIA in both Carlsbad and Bangkok examined several such specimens and concluded that they were almost certainly cleverly manufactured products. Later analysis by George Rossman found the junction to contain what was likely an organic glue (George Rossman, personal communication, 8 April, 2011). Photo: Ken Scarratt/GIA Bangkok

### 11 February, 2008—Tucson Show

In his JCKOnline.com blog, Gary Roskin (2008a) quotes Chris Rose (of Oregon’s Spectrum Sunstone Mine) as saying:

“I talked to one of the people from the laboratory in Japan. This person told me that it was copper diffusion. There was no confusion about what copper diffusion meant with him. I told him I was hoping they were simply heating schillers which naturally contain copper rather than introducing foreign copper. It was very clear he was talking about introducing foreign copper. He even described the process that he observed in China, how they put the copper in it. Basically, to get diffusion all the way into the stone, they have to heat it for 30 days, after which time further diffusion is drastically slowed and only partly into the stone because a rind develops on the stone which prevents the further diffusing of copper. To get around this, they take the stones out of the oven and tumble them to get that rind off and they repeat the process two more times for a total heating time of 90 days.”

According to Masaki Furuya, this account lost something in translation, in that the treatment described by JGGL was actually performed in Bangkok (not China), but by this point the evidence of an andesine treatment is growing (Masaki Furuya, personal communication, 2 April, 2011).

### March, 2008

JGGL provides Gary Kratochvil (also of Oregon’s Spectrum Sunstone Mine) with photos of the treatment performed by a foreigner in Bangkok (Masaki Furuya, personal communications, 2 April, 2011).

### 17 May, 2008

Gary Kratochvil posts JGGL’s photos showing andesine from the Bangkok-based treater in various stages of enhancement (Kratochvil, 2008).

### Salted mine?

IN the early days of European settlement of North America, salt along the Atlantic seaboard was often obtained by boiling sea water in iron vessels. Later, as the immigrant population spread into the continent’s interior, salt was obtained from salt water wells or springs. Since the owners could produce and sell salt, properties that featured salt water resources were quite valuable. Thus it was not long before clever entrepreneurs starting adding salt to fresh water wells in order to make the property more attractive to those looking to enter the salt trade. This is the origin of the term “salting a well” and later came to be used to refer to any type of mine that was “enhanced” by those looking to make a fast buck (Cox, 2001).

### 23 July, 2008

JGGL publishes a paper detailing evidence of andesine treatment both from Bangkok and from China. They also reference the theft of a treatment process from Shenzhen in 2002, as well as provide pictures of an alleged andesine mine in Tibet, complete with pictures of “matrix” specimens (Furuya, 2008).

### October–November, 2008

Ahmadjan Abduriyim and several other andesine dealers and gemologists visit a locality in Tibet (Bainang) and recover what appears to be natural red andesine. The party includes Masaki Furuya of the JGGL; David Chiang of BBJ Bangkok Ltd. (a company associated with JTV); Marco Cheung of Litto Gems, Hong Kong; Christina Lu of MP Gem Corp., Kofu, Japan; Wong Ming of King Star Jewellery Co., Hong Kong) The visit is organized by Chinese miner, Li Tong. Abduriyim and



Wong Ming also visit Inner Mongolia (Guyang County), which produces pale yellow feldspar said to be the starting material for much of the treated andesine in the market. Samples are collected at each locality. Abduriyim's subsequent reports from the field expeditions are questioned, for reasons both sound (Rossman, 2009) and surreal (Hughes, 2010).

### 12 November, 2008

In laboratory experiments, John Emmett and Troy Douthit demonstrate that it is possible to diffuse copper into andesine (Roskin, 2008d).

### September, 2009

Richard Hughes sees a specimen of "andesine in matrix" at the Litto Gems booth at the Hong Kong Jewellery Show (Figure 3). Examination with a loupe shows suspicious features, including glassy material at the junction between the andesine crystals and the "matrix." He brings the specimen to the attention of the GIA's Ken Scarratt, suggesting it be brought into the lab for testing.

### October, 2009

Masaki Furuya and Claudio Milisenda make a presentation to the International Gemological Conference in Arusha, Tanzania. Their presentation showed that FTIR might provide clues to separate untreated "Tibetan" andesine from the treated stone. They also mentioned that a natural red plagioclase (labradorite-bytownite) feldspar deposit existed in Japan, at Miyake Island, near Tokyo (Furuya & Milisenda, 2009).

### November, 2009

Adolf Peretti of GemResearch Swisslab (GRS) is taken to an alleged locality in Tibet by Li Tong, the same Chinese man who helped organize the 2008 Abduriyim Tibet trip. The locality visited by Peretti is in Gyaca County, east of Lhasa and hundreds of kilometers away from the Bainang locality visited in 2008. Peretti concludes that the new locality has been "salted" and, upon testing the samples collected, concludes the deposit he was taken to is a fake (Fontaine, *et al.* 2010).

### May–June and August, 2010

In the summer of 2010, a team of gemologists and researchers from China's National Gemstone Testing Center (NGTC) make two visits to Tibet. On the first trip, they visited a locality near Zha Lin village and during the second trip, visit two sites in Bainang valley. However they are not allowed to visit the diggings at Bainang where the 2008 Abduriyim expedition collected samples. Following the analysis of their samples, they conclude that the sites they visited were probably salted, but that the question can only be truly answered with a full survey of the area (Weiwei Wang, *et al.*, 2010).

### September–October, 2010

The second Abduriyim-led trip visits Tibet. It includes Ahmadjan Abduriyim, Brendan Laurs (Gemological Institute of America, Carlsbad), Richard Hughes (RWH Publishing), Thanong Leelawatanasuk (Gemological Institute of Thailand),

Flavie Isatelle (independent French geologist on behalf of GIA Bangkok), Young Sze Man (*Jewellery News Asia*) and Christina Lu. Li Tong and his wife Li Ping organize the trip.

The party is prevented from visiting Bainang by a group of Tibetan monks (who claim earlier mining upset mountain spirits) and so concentrates on collecting specimens one valley to the West, where andesine is also allegedly found. The group finds andesine only on the surface at Upper Yu Lin Gu, but it is also found beneath the surface at Lower Yu Lin Gu (just above Zha Lin village), even in randomly chosen places (such as under bushes) where there is no evidence of surface disturbance. Upon returning to Guangzhou, Richard Hughes arranges with Marco Cheung of Litto Gems to have the "matrix specimen" analyzed by the GIA in Bangkok.

### October, 2010 to the present

Analysis, analysis, analysis. Those gemologists participating in the 2010 Abduriyim expedition released preliminary findings in early November, 2010, with the caveat that a detailed analysis of specimens would have to be performed before final conclusions could be drawn. Those analyses are still underway.



## Possibilities

IN reviewing both the historic data as well as that derived from field work, when it comes to the Tibetan localities visited by the author (Yu Lin Gu and Zha Lin), the following possibilities appear to exist:

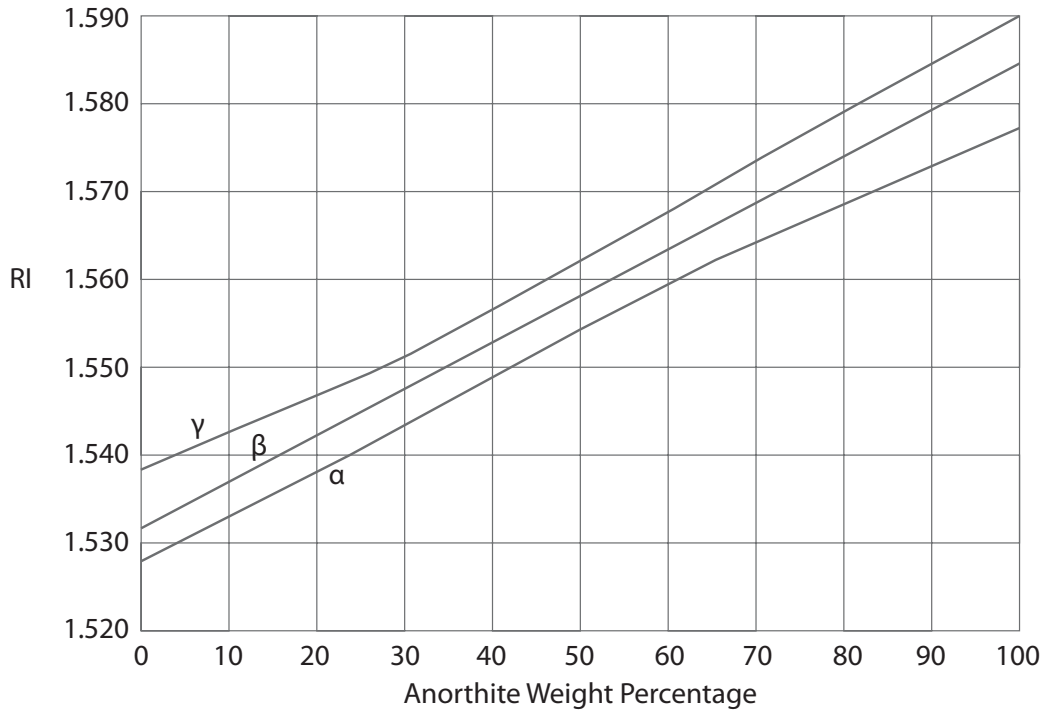
- \* The deposits are all natural
- \* The deposits are all salted with treated and/or natural material from elsewhere (Inner Mongolia?)
- \* The deposits are natural, but salted with treated material from elsewhere
- \* The deposits are natural and salted with treated material from the same mine
- \* The deposits are natural and salted with treated material from the same mine and from elsewhere

It will be up to the analysis to show just where the truth lies.



### Plagioclase Feldspar Series

	← NaAlSi <sub>3</sub> O <sub>8</sub> → CaAl <sub>2</sub> Si <sub>2</sub> O <sub>8</sub>					
Subspecies	Albite	Oligoclase	Andesine	Labradorite	Bytownite	Anorthite
Optic Sign (2V Angle)	+(77°)	-(82°)	+/- (76-86°)	+(85°)	-(86°)	-(70°)
Birefringence	0.011	0.007	0.008	0.012	0.009	0.013
Specific Gravity	2.57-2.69	2.62-2.67	2.65-2.69	2.69-2.72	2.72-2.75	2.75-2.77



**Figure 4.** Various members of the plagioclase series plotted by composition and refractive index. Because the 2V angles of many of these subspecies are so close to 90°, optic sign is an extremely tenuous method of separation for stones that lie near subspecies boundaries. Ditto differences in refractive index and/or birefringence and specific gravity. A better method is to measure composition directly using techniques such as electron microprobe analysis. According to George Rossman (personal communication, 8 May, 2011), the optical properties of andesine depend not only on the Na/Ca ratio, but also on the Al/Si order. So, the optical issue is more complicated than what this simple graph implies. Illustration: Richard W. Hughes, based on data from Arem (1987).

### Questions

***Is it possible to identify diffusion-treated andesines based on simple gemological tests such as refractive index?***

To the best of the author’s knowledge, no. Within an isomorphous mineral series, as composition varies, so too will properties such as refractive index and specific gravity (Figure 4). In former times, mineralogists and gemologists had no easy method of determining a specimen’s chemical composition, and so did so indirectly through RI, birefringence, optic sign and SG measurements. With the modern analytical techniques (such as electron microprobe) available in major gem labs today, direct compositional measurements are possible. The degrees of error in such modern measurements are generally far less than those using RI and SG. However, a skilled gemologist who knows how to make careful RI and SG measurements can come close to determining composition.

Similarly, an operator with access to the most modern analytical tools can completely botch the job if they do not fully understand the tools and their operation. With each technique,



**Figure 5.** The Shui Quan village mine in Gu Yang County, Inner Mongolia, which is thought to be the source of much of the feed material for the andesine diffusion treatment. From left to right: Ye Kai (Economic Development Area Control committee of Wu Chuan County), Ahmadjan Abduriyim, Wong Ming (King Star), Wang Gou Ping, son of Ye Kai. Photo courtesy of Ahmadjan Abduriyim





**Figure 6.** The author excavating beneath a randomly chosen bush just above Zha Lin village in Tibet. Andesines were found well below the surface in two out of three of such randomly chosen spots by the 2010 Abduriyim expedition. In order to salt this mine, one would presumably have had to both know that our party would dig beneath bushes, and thus to carefully place samples across a wide valley under perhaps as many as a thousand bushes. Photo: Brendan Laurs

experience counts. But because plagioclase definitions are linked to specific, immobile composition ranges of elemental ratios, a direct measurement of composition is unswayed by impurities that might affect RI and SG. Thus while a specimen might have impurities that boost its RI or SG, they do not contribute to the separation of whether or not said specimen is labradorite or andesine. As a result, techniques that can accurately measure those element ratios trump those that rely on property shifts to indirectly indicate compositional changes.

***Could the starting material for the diffused andesines in the market have come from Mexico?***

According to George Rossman (2009) and others, samples collected in Inner Mongolia are significantly different from similar feldspars from Casas Grandes (Mexico) and Oregon. If someone wants to Cu-diffuse feldspar, they need a natural starting material of low cost. The available evidence from a number of different sources suggests that the starting material for Cu-diffused andesines is material from Guyang, Inner Mongolia (China).

***What about India? Could the starting material have come from India?***

Indian sunstone falls into the oligoclase range of the plagioclase series. None of the treated andesines in the market have tested out as oligoclase. Furthermore, the Indian sunstones contain hematite plates, rather than copper.

***What about immersion-based microscopy?***

Immersion microscopy allows one to clearly see into a specimen by removing surface reflections. In the hands of an experienced operator, such a technique is extremely powerful. But like all tools, experience is key. Those with less experience can often make mistakes.

The world's foremost gem inclusion expert, John Koivula, described the use of the microscope as being unlike virtually every other instrument, in that the information gained is not a numerical value, but subjective imagery that could be

## Bickering Thieves Arrested After Stealing Professor's Data

**Xi'an**—Two men were hired to steal twenty-three notebooks from a Professor who has been experimenting for over ten years on methods of changing the color of gemstones. The two suspects attempted to sell eight of the notebooks for 80,000RMB [US\$12,315], but began to bicker over how to split the money. The Xi'an police seized the opportunity when the two men were arguing and arrested both suspects. All twenty-three notebooks were safely returned to the Professor.

On September 20th, the Xi'an police reported that twenty-three notebooks were stolen from the office of a Professor. The Professor has been experimenting with changing the color and improving the quality of near gem-grade feldspar for the last ten years. In addition to documenting these experiments, the Professor has also specified how he has altered the design of machinery and furnaces used for heat-treatment of the feldspar in his notebooks. The Xi'an police were closely monitoring this case, and were interviewing employees of the Professor.

On October 30th, a man identifying himself as Shenzhen police called the Professor and claimed he had details that could help the Professor recover the missing notebooks, but demanded 50,000RMB [US\$7,696] in exchange for the information. The man then gave an account he created under a fake name, and asked the Professor to wire the money to this account. On November 12th, the Xi'an police learned of the situation and arrested suspect, Zhang Yuan Jun, 30, from Shandong. Two other Shenzhen men, Ye Bing Jian, 30, and Li Ke were also apprehended as cohorts and charged with breaking and entering into the Professor's office, stealing the notebooks, and attempting to extort money. The twenty three notebooks were recovered and returned safely to the professor.

*Sanqin Daily, Xi'an, 21 November, 2002*

Translated by Alice Tang & Jessica Yao

interpreted in widely different ways, depending on the skill and experience of the operator.

While the Chinese andesines tend to have green cores and Oregon stones have red cores, exceptions to each do exist. To date, the various zoning patterns found in verified natural plagioclase sunstones (such as from Oregon) are replicated by the treated stones (Rossman, 2009; McClure, 2009). This is thought to be because the natural stone also had copper introduced into it by natural diffusion processes in the ground.



### ***Are diffusion treatments possible only with corundum?***

No. Professional gemologists have long known that diffusion treatment is possible in many different types of gem materials. Indeed, Thom Underwood and the present author published a paper on what was described as a diffusion process of topaz (a process developed by gem treater Richard Pollak) over a decade ago (Hughes & Underwood, 1999).

In 2007, rumors started to spread in the trade that blue zircon was being treated by an unknown “diffusion” process. The author quietly investigated this with a number of other gemologists and dealers, both in the US and SE Asia. In the end, no evidence for the treatment could be found. This does not mean the treatment doesn’t exist, it simply means that no evidence could be found. Gemologists cannot be involved in publishing rumors; we need hard evidence.

### ***Beyond the reports from Abduriyim based on his 2008 visit, what evidence is there for the existence of a gem-quality feldspar mine in Inner Mongolia?***

Quite a bit. In 2008, the Inner Mongolian deposit was not visited solely by Ahmadjan, but also by Wong Ming (a Hong Kong-based dealer; see Figure 5). In addition, there have been papers published in the Chinese scientific literature on the deposit since 1991 (Haifu Li, 1991, 1992a, 1992b; Yue Cao, 2006). The date of publication of many of these papers was long before there was any mention of treated andesine. Indeed it was a full decade before the first “Congo” andesines appeared in the market.

### ***Could someone have planted stones beneath the bushes your party excavated in 2010?***

Everything and anything is possible, but one must consider probabilities. We did our best under the circumstances to rule out the possibility of the mine being salted. Thus we did not simply dig holes where locals told us to dig, but deliberately chose undisturbed locations at random, away from places we were directed to by Li Tong and the people around him (Figure 6). No one knew in advance that we would attempt to dig beneath bushes. To salt this deposit, one would have had to literally plant stones under a thousand or more bushes, at a time when they had no idea we would even be digging under bushes. The probability of this is slim, at best.

### **Acknowledgments**

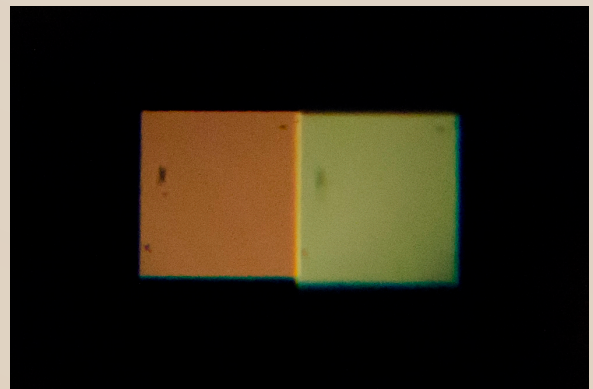
So many have helped school the author in andesine, but he would like to specially thank the following for their help in compiling this timeline: Ahmadjan Abduriyim, Masaki Furuya, Christina Iu, Alice Tang and Jessica Yao.

### ***What about the pleochroism?***

It has been reported that Oregon sunstone can be separated from Chinese stones by reference to their pleochroism, with the former showing a unique red/green pleochroism.

Sadly, we have not found this to be the case (Figure 7). Both the author and Adolf Peretti have checked numerous specimens and determined that those with green zones show this red/green pleochroism, while those that are entirely red do not.

When examining such stones, we have found that, if they are entirely red in normal reflected light, they do not show red/green pleochroism. And yet if in some lighting conditions, a green color is seen, they will show a red-to-green pleochroism. This holds true for the Oregon material and also that from Tibet.



**Figure 7.**

Top: A piece of andesine obtained by the author at Tibet’s Zha Lin/Yu Lin Gu mines. It clearly displays a green core.

Photo: Richard W. Hughes

Bottom: The same specimen photographed through a calcite dichroscope. When the dichroscope is correctly positioned over the green core alone, it shows red/green pleochroism.

Photo: Billie Hughes

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This paper is a slightly modified version of one that is part of a large multi-institutional research project published by the Gemological Institute of America, and includes the following papers:

- \* Abduriyim, A., McClure, S.F., Rossman, G.R., Leelawatanasuk, T., Hughes, R.W., Laurs, B.M., Lu, R., Isatelle, F., Scarratt, K., Dubinsky, E.V., Douthit, T.R. and Emmett, J.L. (2011) Research on gem feldspar from the Shigatse region of Tibet. *Gems & Gemology*, Vol. 47, No. 2, pp. 167–180.

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<http://www.gia.edu/research-resources/news-from-research/special-issue2-homepage.html>

- \* Abduriyim, A. and Pogson, R. (2011) Separation of natural red andesine from Tibet and copper-diffused red andesine from China. *GIA: News from Research*, 14 pp. <<http://www.gia.edu/research-resources/news-from-research/separation-abduriyim.pdf>>
- \* Hughes, R.W. (2011) Andesine: Timeline of a controversy. *GIA: News from Research*, 14 pp. <<http://www.gia.edu/research-resources/news-from-research/timeline-hughes.pdf>>
- \* Laurs, B.M., Abduriyim, A. and Isatelle, F. (2011) Geology and field studies of reported andesine occurrences in the Shigatse region of Tibet. *GIA: News from Research*, 10 pp. <<http://www.gia.edu/research-resources/news-from-research/geology-laurs.pdf>>
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