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All About Colored Gemstones

SAPPHIRE MINING IN LAOS
BALANCING COMMUNITY AND ENVIRONMENTAL NEEDS

Modernizing Small-Scale Mining in Kenya
New Technique for Gemstone and Pearl Testing
Jewelry Art: Passionate Conflict

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The land-locked country of Laos lies sandwiched between Thailand and Vietnam. (Laos is a plural French/English corruption of the more proper Lao. Similarly, the capital, Vientiane, is a corruption of Wiang Chan, literally ‘city of sandalwood.’) Largely mountainous, much of Laos remains untouched by the outside world. But this is quickly changing. The country once known as the “Land of a Million Elephants” is today a major producer of copper and gold... and now sapphires.

Location

The major sapphire deposit in Laos is at Ban Huay Xai (also Ban Huai Sai, Ban Houei Sai). (Huay is Lao for ‘stream’ or ‘torrent.’) Huay Xai is situated on the banks of the Mekong River in Laos, directly opposite the Thai town of Chiang Khong. (In addition to Huay Xai, a deposit of dark blue sapphire exists in southern Laos at Attapeu.)

This is the infamous “Golden Triangle” region, where the borders of Thailand, Laos, and Myanmar meet. Once the center of opium and heroin production, today it is a popular tourist destination. Huay Xai is the capital of Laos’ Bokèo District. Bokèo means literally “gem mines” (bo = mine; kèo = gems or glass). A bridge across the Mekong River at Chiang Khong–Huay Xai is now under construction and will...

Laos – Land of A Million Elephants... and Sapphires

There is a hill in the Southeast Asian country of Laos with an unforgettable view. Look north and on a clear day you can spy the jungle mountains of Myanmar (Burma). Both China and Vietnam lurk in the shadows, just out of sight. Below the hill, flows one of Asia’s greatest rivers—the mighty Mekong, with Thailand on the opposite bank. Over a hundred years ago, a farmer pulled something extraordinary from the mud near that river.

By Richard W. Hughes, Auslan Ishmael, Flavie Isatelle, and Peter Wang
provide a direct link between China, Laos, and Thailand.

**History of the Mines**

In 1890 (Bernard, 1975, lists this date as 1880), Shan diggers from Burma discovered nin (black spinel, an accessory mineral of corundum) at Chiang Khong (Huay Xai), which lies just across the Mekong River from Thailand, in Laos. With typical patience they carefully prospected the area and eventually found sapphires.

The best account of the discovery of sapphires at Huay Xai is that of Herbert Warington Smyth in his 1895 *Notes of a Journey on the Upper Mekong, Siam* (b. 1867; d. 1943). Then in the employ of the Siam Department of Mines, Smyth was sent by the Thai King to report on the newly discovered gem deposits at Chiang Khong, arriving at the mines in February 1893:

> The gem-bearing gravel is not found until several basalt sheets are encountered below Nam Ngau, a largish tributary flowing in from the north. The hills on the left bank then become lower and more distant, and these, consisting of a dark crystalline rock, the exact mineralogical character of which has not yet been determined, seem to be the source of all the stone-bearing gravels which are found deposited in the streams flowing from them. The average thickness of the gravel is 5 to 20 inches, and consists of quartz and fragments of the crystalline rock above mentioned. The overburden is a reddish clay soil of an average depth of 10 feet, through which the Burmese, who are found wherever there are gems, sink large pits some 10 feet square. A sharpened bamboo will be often first driven down to ascertain if the gravel underlies the spot, it having been found very capricious.

Explorations were made in the neighbourhood for many years before—about two years ago—the first paying gravel was found; the Burmese relying all the time on the presence of what is known as nin, small black stones which have turned out to be black spinel, and are always to be found in close proximity to the sapphire. When washing gravel in a stream these little water-worn crystals are found; it will only need industry and time to find the gem gravel, which will be somewhere near, although in part perhaps denuded away. The nin have been followed for years, and now there are over two hundred men reaping the reward of their indefatigable patience. I found nin and struck gravel in all the streams flowing in on the left bank between Nam Ngau and Hoay Pakham, which is the main scene of the operations at present, and lies about 1 mile below Chieng Kong. On the right bank there are apparently no signs whatever, except at Hoay Duk, a stream exactly opposite Hoay Pakham; but only a few nin are to be seen here, and there is no water for washing purposes. East and north of Hoay Pakham, again, are half a dozen more streams flowing, from that side of the range I have spoken of as the source of the gravel, into the Nam Hau, which eventually reaches the Mekong. Some of these have been found to be rich, and on one the Burmese built their bamboo villages and made their clearings; but after a fortnight’s work the places were abandoned as being terribly unhealthy, sunk deep in the jungle valleys, and very difficult to get stores to…

With regard to the rubies I had expected to find, from my own observation, and subsequently from conversation with the diggers, I soon saw that not only have none been ever found, but none of the signs of the ruby as known...
at Chantabun or in Burma have been seen. A Siamese official who had been sent here a year ago by the Government to test and report on the place, seeing some small garnets, thought they must be rubies, and thinking to advance himself at head-quarters, bought a very fine Burmese ruby for 70 Rs., and sent it down with his report as having been found in Chieng Kong! From this, of course, very large hopes of the character of the find had been entertained: I fear now he is somewhat in disgrace.

While the occurrence at Huay Xai has been known since the 1890s, due to the small size of the gems recovered, the promise was never fully realized. Little serious mining occurred until the 1960s. Like many other sapphire mines, modern heat treatments make salable what was once too cloudy or dark. Thus, the 1970s and 1980s saw a small-scale revival of sapphire mining at Huay Xai.

Since the 1960s, a variety of companies have rolled the dice, including Czechs, Koreans, and Thais, with one French miner even diving into a sink-hole in the nearby Mekong River to recover gems. But most Lao sapphires were small, and with larger blue heated geuda sapphires from Ceylon flooding the market, little attention was paid to the Lao stones.

In 1994, Bjarne Jeppesen and his wife, Julie Bruns, founded Gem Mining Lao PDR (GML) with Lao-born American, Somkhit Vilavong. They were granted a 15-year concession from the Lao government to mine at Huay Xai. But this was to be a star-crossed venture, one that ended with Jeppesen and his wife fleeing the country amidst charges of embezzlement. His caretakers, Kerry and Kay Danes, were later arrested in a high-profile case that nearly caused a break in diplomatic relations between Laos and Australia (they were eventually released) (Hughes,
In 2000, the Lao Government terminated GML’s mining concession and then nationalized GML’s sapphire mines.

Enter SinoRMC

By the year 2006, the only mining activity in the area was the occasional digging by locals. The Lao government then offered mining concessions to a Taiwanese businessman, Simon Hsu. He formed Sino Resources Mining Co. (SinoRMC) in response, and has operated the mines ever since. Following an exploration program, full production began in December 2009. The company has four claims, at Huay Nam Hoor, Huay Sala, Huay Mone, and Huay Tap, along with a further area of exploration at Huay Hong Nheng.

A production agreement has been made with the biggest sapphire miner in Australia. Together with the Lao mines, this gives the company access to approximately 200 kg of rough sapphire per month, making SinoRMC one of the world’s largest sapphire producers.

Geology of the Sapphire Deposits in Ban Houai Sai, Bokèo Province, Laos

Like the sapphire deposits in Australia, China, Nigeria, Thailand, Cambodia, and Vietnam, sapphire at Huay Xai is derived from secondary deposits associated with alkali basalt flows (Bernard, 1975; Vichit & Vudhichativanich et al., 1978).

About 45 to 55 Ma (megaannum; a million years) ago, the collision between the Eurasian and Indian plates resulted in the movements of the Indochina, China, and Amur plates, causing a disturbance of the ternary junction of the Eurasian, Pacific, and Australian plates. This disturbance created the Gulf of Thailand, the South China and Andaman Seas, along with causing extensional figures in Indochina and southern China (Fedorov et al., 2005, and Bunopas et al., n.d.).

Those extensional systems were the source of Cenozoic volcanism in Southeastern China and Indochina. There were two episodes of Cenozoic igneous activities in Indochina at 42 to 24 Ma and
16 to 0 Ma (Wang et al., 2001). The latest episode produced the source of the sapphire deposits at Huay Xai and was caused by decompression melting of an altered and depleted mantle. The thinning of the lithosphere caused by an extensional system resulted in the eruption of melt-derived igneous rocks.

The area lies on the Shan-Thai cratonic block that has been folded, faulted, and tilted during the Carboniferous Era and then was uplifted during the Cenozoic (Sutherland et al., 2002).

The analyses conducted on zircon inclusions inside those sapphires show a big concentration in heavy rare earth elements (HREE) and depletion in europium (Eu), along with the presence of alkaline feldspars that indicates crystallization from saturated alkaline silicate melts near the lower crust (600° to 900° and 25 to 40 km depth) (Sutherland et al., 2002). Indeed, Huay Xai sapphires are thought to have been transported to the surface in alkaline-basaltic rocks. Huay Nam Hoor, Huay Sala, Huay Mone, and Huay Tap, and areas of exploration (Huay Hong Hneng), lie near those gem-bearing basaltic sources.

Sutherland et al., 2002, studied the sapphires from Huay Xai and reported that since stones do not show any noticeable scratching or chipping typical of fluvial transport, the source must be close to the mines and thus the deposit is alluvial.

Huay Xai sapphires are found with alluvium beneath 30 cm of topsoil and 1 to 1.5-m of overburden. There are three different gem-bearing layers, the richest being the deepest layer. Each pay layer’s composition is different, with enrichment in kaolins and depletion in laterites at greater depth. Thickness of pay layers varies from one place to another and layers are not even always present. However, the bottom layer seems to always be the richest and thinnest. Occasionally, a thick layer of laterites is present in place of the gem-bearing layers; such layers are not washed, as they are barren of sapphire.
Concentrations of black spinel and zircon that are found in association with the sapphires do not show any correlation with the concentration or quality of sapphires recovered.

Regarding qualities, many of the stones collected are of good quality, though most are small in size. Sapphire sizes decrease when going down; thus the third layer contains more small stones than the first layer and vice versa. And so does the quality: the first layer contains 50 percent good stones, the second 40 percent, and the third, 30 percent. This is in contrast to sapphire concentration, which is the opposite.

**Finished Stone Sizes and Qualities**

Lao sapphires generally range up to two carats after cutting, with the majority three mm and smaller. The color of the Lao stone is quite nice, ranging from a medium to deep blue. Small amounts of yellow, green, and black star sapphires are found, in addition to blue. These other varieties constitute less than one percent of production. Accessory minerals include red zircon and black spinel. Traditionally, stones are generally sent across the Mekong River for sale in Thailand.

**Mining – The Foundation of Modern Society**

Virtually any mining activity is disruptive to both the environment and local community and Sino RMC’s Huay Xai mines are no exception. What is important is that disruptions are minimized and benefits maximized, allowing gains to transcend costs. This concept is key to mining anywhere in the world.

We take for granted the products that we use on a daily basis, but because they are so ubiquitous, we don’t really think about what goes into their manufacture. Let’s step back and ponder this for a moment.

*Sorting rough sapphire at SinoRMC’s Huay Xai operation. SinoRMC is one of the largest private employers in Laos’ Bokèo District. (Photo: Ryan Libre)*
Computers and cell phones require a variety of materials for their production, including silicon and copper for microcircuits, along with rare elements like gallium and tantalum. Indeed, virtually every electronic device that we rely on today is created from raw materials taken out of the ground via mining. Ditto the metals and plastics that surround us.

Clearly, modern society needs mining; from the Internet to the iPhone, none of this could exist without extracting raw materials from the earth. And yet, by its very nature, mining is a destructive process. Mining disturbs the land; it causes pollution.

Here is the paradox. We need mining, and yet mining has negative consequences. What to do? The answer is clear. Mining needs to be done in the most eco-friendly way. It’s that simple.

Enter Gem-Ecology – Balancing Community and Environmental Needs

At Huay Xai, farming is the economic mainstay of the local communities. In order for mining to be successful, the company must ensure that local farmers are properly compensated.

The focus is to find a fair system that provides an economic benefit to the communities that we work with. This includes not only monetary compensation and land restoration, but also employment and training opportunities for the local community. Our goal is to ensure that the environment is restored to its original state, with land users having profited in the process. This notion of balancing costs and benefits of gem mining has been termed “gem-ecology” by the University of Vermont’s Saleem H. Ali and Sally Dickinson DeLeon, and we take the idea seriously.

Land Compensation and Restoration

Our mining concession falls entirely within farmland. No forest is cleared for mining. Local land users are rice farmers who rely on this crop not only for subsistence, but also for income generation. This has been the case for many generations. Our mining method is shallow open pit/trench mining, which means that, during the extraction, farmers are economically disabled.

To remedy this, we provide monetary compensation packages for land usage. These packages have been calculated in unison with the farmers and the local government. In doing so, we ensure that farmers’ needs are not just met, but exceeded.

Compensation is in no way complete without land restoration. Thus, in addition to monetary compensation, we restore all mined areas to their original, arable state. This means that farmers can again raise crops or livestock once mining is completed. Furthermore, we carefully monitor the land for three years after restoration, to assist the farmers should any problems arise.

Training, Employment, and Cultural Awareness

Training and employment are two of our success areas. At our Lao operation, 95
percent of our workers are from the local communities. From administration to exploration, mining, sorting and cutting, the skills gained often applicable to industries other than just mining.

Wherever gem miners go, they are guests who must respect the local culture. Towards this aim, our mine management makes a point to take part in festivals and support local customs. Gaining their respect only benefits our operation, putting it in harmony with the local community. In the end, the key to SinoRMC’s Lao operation is not based on charity, but engaging the local community in a respectful way and listening to their needs and concerns. In doing so, we ensure that each side benefits.

IS (InSapphire) – New Directions in Precious Stones

From the beginning, SinoRMC’s management realized that creative thinking would be needed to make Lao sapphire competitive in the market. Because of the small sizes of the stones recovered, a new approach would be needed. Thus was born the IS (InSapphire) concept. InSapphire represents an entirely new approach to dealing with gemstones, taking them out of the jewelry realm and into non-traditional products. The items above are but two examples of the innovative InSapphire concept.

The Royal Mekong Sapphire

To see a world in a grain of sand, and a heaven in a wild flower, Hold infinity in the palm of your hand, and eternity in an hour.

– William Blake, Auguries of Innocence

Sitting on the veranda of SinoRMC’s hilltop office in Huay Xai, one looks out upon a picture-perfect panorama. As the sun sets on the Thai side, the mighty Mekong River rolls towards the sea. To the rear, a road that soon will connect both Laos and Thailand with China snakes off into the green hills. Change is in the air. And yet, some things never change. There are fish in the river and rice in the paddy fields. A hundred years before, a farmer reached into one of those paddies and pulled up a handful of blue stones.

In a world where beauty is almost always ephemeral, sapphires have a magic that has lasted millions of years, from their fiery birth deep underground to their explosive expulsion onto the verdant Lao landscape. With a blue the color of the twilight sky, theirs is a sublime grace, a reminder that some things do transcend.

Reach into the paddy and pick them up. Wipe the mud off. See it? All of creation fused into azure blue pebbles. You now hold infinity in the palm of your hand.

References


