



An Examination on the Historical Distribution and Transformation of Cinnabar Localities Through Chinese Materia Medica Works

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Abstract

The distribution and transformation of cinnabar localities in the history of China as reflected in Chinese materia medica works has been a dynamic process. In the Pre-Qin Period and Qin-Han Dynasties, mining clustered around the few cinnabar localities that were scattered. During Wei, Jin, and the Southern and Northern Dynasties, the number of cinnabar localities gradually increased, and there was a shift of production center. In Tang-Song Dynasties, localities containing cinnabar were more explicitly identified and significantly expanded in size; the tendency toward a shift of production center became more obvious. During Yuan, Ming, and Qing Dynasties, the size of cinnabar localities continued to expand a little. The increasing expansion of the localities and the gradual shift of production center was the result of the interplay of many factors including the medicinal attributes and functions of cinnabar, society's demand for cinnabar, mining technologies, the attributes of cinnabar as a natural resource and its religious and cultural functions. An in-depth examination and understanding of the pattern of distribution and transformation of cinnabar localities through Chinese materia medica works would offer better guidance for present-day mining of cinnabar and selection of authentic herbal medicine.

Key words: Chinese materia medica works; cinnabar localities; historical distribution; transformation

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INTRODUCTION

Cinnabar, also known as Zhusha or Chensha in Chinese, is a kind of herbal medicine with a long history and multiple functions. Documentation of its medicinal use dates back to as early as the Warring States Period in the *Prescriptions for Fifty-two Diseases*: “for skin diseases, use cinnabar and finless eel blood. Chicken blood would also work” (Yan, 2005, p.73). Records of cinnabar localities were recurrent in generations of Chinese materia medica works such as *Shennong's Classic of Materia Medica*, *Supplemental Records of Celebrated Physicians*, *Master Lei's Discourse on Drug Processing*, *Classified Materia Medica*, *A Comprehensive Collection of Materia Medica*, *Collected Essentials of Species of Materia Medica*, *Materia Medica for Decoctions*, *Compendium of Materia Medica*, *Clarifications on Materia Medica Works*, and *Annotations on Materia Medica Works*. Viewed from a vertical historical perspective, cinnabar localities have undergone constant transformations with the passage of time. Although academia has remained sensitive to relevant research, explorations of the characteristics of the distribution and transformation of cinnabar localities as well as factors that have impacted this process from the perspective of Chinese materia medica are relatively lacking. Hence such an exploration is offered here in hopes of some contribution to academia.

1. DISTRIBUTION, CHARACTERISTICS, AND TRAJECTORY OF TRANSFORMATION OF CINNABAR LOCALITIES AS DOCUMENTED IN CHINESE MATERIA MEDICA WORKS

1.1 The pre-Qin Period and Qin-Han Dynasties

During the pre-Qin Period and Qin-Han Dynasties, cinnabar localities overall were characterized by scarcity

of mining sites and clustering of mining efforts. Since the publication of *Shennong's Classic of Materia Medica*, standardized herbalism gradually came into existence; “bencao” (Chinese herbal medicine) became the synonym of research on Chinese materia medica. Thus, although in the pre-Qin Period, no book actually had “bencao” in the name, there were quite a few records of Chinese herbal medicine, including a good amount of description of localities containing cinnabar. The most representative example was the *Legends of Mountains and Seas*, which documented a few cinnabar localities: three in the “Legends of the Southern Mountains”, seven in the “Legends of the Western Mountains”, one in the “Legends of the Northern Mountains”, three in the “Legends of the Middle Mountains”, and four in the “Legends Overseas” (Yuan, 1980, pp.8-167). These historical descriptions, coupled with research on present-day toponym, suggest that cinnabar localities known to humans at that time were distributed in a dotted manner, spanning the entire territory of China from the west to the east, including present-day Henan, Hubei, Hunan, Sichuan, Shanxi, Guizhou, Ningxia, Qinghai and more (Xu, 1991, pp.203-274).

True exploitation of cinnabar mines of scale was first documented in the “Biographies of Merchants” in *Records of the Grand Historian*: “In Ba lived a window named Qing whose ancestors found a cinnabar mine. Several subsequent generations made a profit from the mine; her family became immeasurably wealthy” (Sima, 1963, p.3260). The earliest existing Chinese book on materia medica, *Shennong's Classic of Materia Medica*, which was compiled into a book in the Eastern Han Dynasty, also included a record of cinnabar being “found in the valleys of Fuling” (Shang, 1981). Fuling in Qin-Han Dynasties was called Fuzhou, a part of Ba Prefecture, near the present-day Pengshui District and Qianjian District of Chongqing City roughly. In the Western-Han Dynasty, when the system of prefectures and counties was relatively mature and stabilized, there were 103 prefectures in the nation (Ban, 1975), but cinnabar mining was limited to one prefecture at a site that accounted for less than 1% of the nation’s territory. It can thus be inferred that cinnabar mining was very limited and tended to cluster around the south-eastern region of present-day Chongqing.

1.2 Wei, Jin, and the Southern and Northern Dynasties

Compared with previous dynasties, Wei, Jin, and the Southern and Northern dynasties witnessed a gradual expansion of cinnabar localities and a shift of the production center. Materia medica works all referred to cinnabar localities other than Fuling, *Supplemental Records of Celebrated Physicians* and *Variorum of Shennong's Classic of Materia Medica* being the only two exceptions. *Wupu's Work on Materia Medica* states that cinnabar “could be found in Wuling” (Wu, 1987,

p.1). Tao Hongjing also annotated that cinnabar “was found in Wuling, to the west of the river, in the regions of ethnic minorities”. He also noted that “*Immortal Classics* mentioned cinnabar of Yue, i.e., cinnabar from Linzhang of Guangzhou¹; these two places both produced cinnabar of high quality” (Su, 2005, p. 87). A well-known book on drug-processing published during this historical period, titled *Master Lei's Discourse on Drug Processing*, used such a proper noun as “cinnabar of Chen and Jin”, denoting a certain kind of cinnabar that was apparently named after its places of origin.

Wuling mentioned previously was originally part of the Qianzhong prefecture during the reign of Emperor Gao in the Western Han Dynasty; it became part of Jinzhou during Wei, Jin, and the Southern and Northern Dynasties; under its jurisdiction was the regions to the west of the present-day Yuan River of Hunan Province, the eastern part of Guizhou Province and etc. (Shi, 2005, p.1439). “Cinnabar of Chen and Jin” mentioned by Master Lei referred to cinnabar obtained from mining sites near Chen River and Jin River, both of which were tributaries of the Yuan River and were located within the boundaries of Wuling Prefecture. “Linzhang of Guangzhou” referred to Linzhang Prefecture established during Song of the Southern Dynasties, located to the south of present-day Pubei County of Guangxi Province. It was part of Guangzhou during Wei, Jin, and the Southern and Northern Dynasties, located on the borders of three adjacent present-day counties in Guangxi Province: Hepu County, Pubei County, and Lingshan County. It can be seen accordingly that during Wei, Jin, and the Southern and Northern Dynasties, with West Xiang, East Qian, Guangxi and so forth being newly added to the original Southeast Yu, the number of cinnabar localities more than doubled what it had been before, when there was only one isolated prefecture where cinnabar mining occurred.

What is worthy of attention is Tao Hongjing’s statement that “Fuling is what we know as Fuzhou, located on the southern border of Ba Prefecture, a cinnabar locality no longer witnessing any mining activities.” In other words, Tao believed that at the time no one continued to engage in cinnabar mining in Fuling, but that was far from being true. Su Shi of Song Dynasty wrote the following: “Tao stated that ‘Fuling is what we know as Fuzhou, a cinnabar locality no longer witnessing any mining activities’. But I heard from people who

¹ Guangzhou here refers to the region that covers the majority of present-day Guangdong province and Guangxi province. It became part of Jiaozhou in the fifth year of the reign of Emperor Sun Quan of Wu Kingdom during the Period of the Three Kingdoms (AD 226.). Linzhang became a prefecture during Song of the Southern Dynasties and lost its prefectural status during Liang-Chen of the Southern Dynasties. It was located to the northeast of present-day Hepu County of Guangxi Province approximately and was part of Guangzhou during Wei, Jin, and the Southern and Northern dynasties.

are familiar with the place that ‘from time to time herb pickers would find cinnabar there but they were not much interested in cinnabar mining there because cinnabar of Chen and Jin was much more popular at the time’” (Su, 1998, p.33). Su’s writing suggests that the Fuling region remained a cinnabar locality in Tang-Song Dynasties, long after Wei, Jin, and the Southern and Northern Dynasties. Thus it can be inferred that during Wei, Jin, and the Southern and Northern Dynasties, Fuling was still a locality containing cinnabar although its status had been challenged; in terms of cinnabar mining, it was gradually being replaced by Wuling and Lingnan regions at the time.

1.3 Tang-Song Dynasties

In Tang-Song Dynasties, localities containing cinnabar were more explicitly and concretely identified; they significantly expanded in size, and the tendency toward a shift of mining sites also became more obvious.

The *Newly Revised Materia Medica*, published in Tang Dynasty, mentioned a kind of cinnabar called “Mocuo”, which was named after its place of origin. It is noted in the “Places of Origin of Herbal Medicines” in *A Supplement to the Precious Formulas Worth a Thousand Gold* that cinnabar was found in “Chenzhou of the Western Prefecture of Jiangnan.” *Materia Medica of Shu* published during the Five Dynasties stated that cinnabar was available “in the valleys of Fuling.” *Illustrated Materia Medica*, published in Song Dynasty, states that “cinnabar localities included Chenzhou, Yizhou, and Jiezhou, with Chenzhou being the best-known one, producing what was called cinnabar of Chen.” As documented in *Materia Medica of Kaibao*, “cinnabar from Chenzhou and Jinzhou has the highest medicinal value; cinnabar from other places is of inferior quality.” *Classified Materia Medica* mentioned that “cinnabar was also available in Chunzhou and Rongzhou, which were both close to Yizhou”. Moreover, *A Comprehensive Collection of Materia Medica* referred to “a mildly yellow kind of cinnabar found in Shangzhou.” *Materia Medica of Shaoxing* referred to “an extremely large kind of cinnabar with a bright shine bearing some resemblance to cinnabar originated from Yizhou.” *Augmented Materia Medica* “added Huangzhou to the list of cinnabar localities”, and the *Introduction to Illustrated Materia Medica* “added Yuanzhou and Mayang.” According to An Overview of the Highlights of Various Geographic Regions, “Mocuo Mountain is located within the boundaries of Qianzhou. This extremely tall mountain is the residence of ethnic minority groups, hence a trouble spot on the borders”. Specifically, it is located in present-day Xianfeng County of Hubei Province approximately. The region under the jurisdiction of Chenzhou at the time coincides with present-day Yuanling County of Human Province; the region under the jurisdiction of Fuzhou at the time coincides with present-day Pengshui County of Chongqing Municipality; the region under the jurisdiction of Yizhou at the time

coincides with the present-day suburbs of Yishan County of Guangxi Province; the region under the jurisdiction of Jiezhou at the time coincides with the present-day western part of Kang County of Gansu Province; the region under the jurisdiction of Jinzhou coincides with present-day Tongren City of Guizhou Province; the region under the jurisdiction of Chunzhou coincides with present-day Yangchun City of Guangdong Province; the region under the jurisdiction of Rongzhou coincides with the region near present-day Rongshui County of Guangxi Province; the region under the jurisdiction of Shangzhou coincides with present-day Shangluo City of Shanxi Province; the region under the jurisdiction of Xinzhou coincides with the region east to present-day Guixi of Jiangxi Province; the region under the jurisdiction of Huangzhou coincides with present-day Xinhuang County of Hunan Province; the region under the jurisdiction of Yuanzhou coincides with present-day Zhijiang County of Hunan Province; the region under the jurisdiction of Mayang coincides with present-day Mayang County of Hunan Province (Zhu, 2003, p.1052). It can be concluded from the above alone that cinnabar localities that have been explicitly identified since Tang-Song Dynasties added up to thirteen, including Qianzhou, Chenzhou, Fuzhou, Yizhou, Jiezhou, Jinzhou, Chunzhou, Rongzhou, Shangzhou, Xinzhou, Huangzhou, Yuanzhou, and Mayang. Among the thirteen localities, Fuzhou had already been documented as a cinnabar locality in Qin-Han Dynasties, and Qianzhou, Chenzhou, Jinzhou, Huangzhou, Yuanzhou, and Mayang were part of the Wuling Prefecture, documented as a cinnabar locality in Wei, Jin, and the Southern and Northern Dynasties. However, compared with the ambiguous overall sketches of these geographic regions in previous dynasties, the description of cinnabar localities provided in the materia medica works of Tang-Song dynasties was apparently more explicit and concrete. Further, six localities, including Yizhou, Jiezhou, Shangzhou, Chunzhou, Rongzhou, and Xinzhou, were new additions to the list; they had not been mentioned in any Chinese materia medica works published in previous dynasties. It can be seen that cinnabar localities were expanding continuously in the present-day Shanxi, Gansu, Jiangxi, Guangdong, Guangxi and other provinces. Meanwhile, the tendency toward a shift of the mining sites became even more obvious in Tang-Song Dynasties. *Illustrated Materia Medica* commented as follows: “Chenzhou was part of the former Wuling Prefecture. Although the well-known cinnabar of Chen originated from here, due to small quantity of production, miners often got their cinnabar from Xixu and Jinzhou.” *Materia Medica of Kaibao* also mentioned that “Tao Hongjing’s observation about the availability of cinnabar in west Szechuan was misleading because cinnabar might be available in the region where ethnic minorities lived.” In addition, it was mentioned in *Augmented Materia Medica* that

the cinnabar of Chenzhou was mostly obtained from the region where the ethnic minority group of Dong lived, in the Old Crow Well in Jielliao Dong within the boundaries of Jinzhou Prefecture. The well ran as deep as dozens of Zhang.

It can be seen that the mining of high-quality cinnabar in the region that used to be within the boundaries of Xiangxi was coming to an end and the adjacent Wuxi and Jinzhou regions started to gain popularity. These changes suggest that in Tang-Song Dynasties, although the production center for high-quality medicinal cinnabar remained in Xiangxi and Qiandong, there was also an internal shift in this region toward Qiandong. In terms of output, according to “Monograph on Food and Merchandise” in the *History of Song Dynasty*,

cinnabar was produced in Shangzhou and Yizhou; there were three mining sites in Fushun County...In the first year of the reign of Emperor Yuanfeng of Song Dynasty...the total amount of cinnabar obtained from these three sites weighed over 3646 Jin and 14 Liang. (Tuotuo et al., 1977, p.4524, 4526)

By contrast, Guangming cinnabar from Chenzhou and Jinzhou was presented to the emperor as routine tribute with an annual production of dozens of Liang, which was very little compared with the amount of production in Shangzhou and Yizhou. Apparently, during Tang-Song dynasties, Shanxi and Lingnan regions became the newly popular cinnabar mining sites except for Wuling.

1.4 Yuan, Ming, and Qing Dynasties

During Yuan, Ming, and Qing dynasties, cinnabar localities expanded to some degree on the basis of existing sites.

In terms of documentation of cinnabar localities, *Notes on the Addendum to the Explanation of the Medicinal Property of Pearl Sac, Elaboration on Materia Medica Works, Collected Essentials of Species of Materia Medica, Notes on Shennong's Classic of Materia Medica, Bencao Meng Quan* and other materia medica works directly borrowed from previous publications. The *Compendium of Materia Medica* written by Li Shizhen in Ming Dynasty noted a few cinnabar localities that had not been mentioned in materia medica works published during previous dynasties: “Cinnabar is also found in Yongzhou”; “the kind of cinnabar found in Louzhou is very similar to cinnabar of Chen”; “cinnabar from Yunnan, Bosi, and Xihu is all shiny, smooth, and usable” (Li, 2007, p.518). Another example of documentation of cinnabar localities during this historical period is *Annotations on Materia Medica Works*:

Cinnabar is also known as Zhusha. It originated from the valleys of Fuzhou. Nowadays it is available in a lot of places such as Chenzhou, Jinzhou as well as Yunnan and the caves in Bosi where those ethnic minority groups live. (Zhang, 2008, p.1118)

In addition, *Food as Materia Medica* offers an examination on “water”; it mentioned several “cinnabar springs”.

There is a hot spring on the fourth peak of the Yellow Mountain located northwest of Huizhou Prefecture²...one can see occasional gushes of cinnabar water when the water turns red.

“Dan Spring is in the stone caves located in the Xishan Valley in Jianchang Prefecture³. Cinnabar flows with the water” (Yao, 1994, p.71, 151, 227). The region under the jurisdiction of Yongzhou Prefecture in Yuan, Ming, and Qing Dynasties is on the southern bank of Yong River in present-day Nanning City of Guangxi Province; Maping County, the prefectural center of Liuzhou at the time, coincides with present-day Louzhou City of Guangxi Province and adjacent regions; the prefectural region under the jurisdiction of Huizhou Prefecture at the time is located near present-day Huangshan City, Xinxian County, and Xiuning of Anhui Province; the prefectural region under the jurisdiction of Jianchang Prefecture at the time is located in present-day Nancheng County of Jiangxi Province. Yunan refers to present-day Yunnan Province; its prefectural center is located in present-day Kunming of Yunnan Province. Bosi refers to present-day Iran; Xihu is a Chinese umbrella term for foreigners west of the Western Regions, and cinnabar of Xihu most likely originated from present-day central Asia and adjacent regions. It can be seen accordingly that the list of newly added cinnabar localities documented explicitly in Yuan, Ming, and Qing Dynasties included Yongzhou, Liuzhou, Huizhou, Jianchang Prefecture, Yunan Province and even the foreign region of Bosi, which produced high-quality cinnabar; this suggests continued expansion of cinnabar localities at the time.

2. CONTRIBUTING FACTORS IN THE TRANSFORMATION OF CINNABAR LOCALITIES

2.1 Medicinal Attributes and Functions of Cinnabar

In traditional Chinese medicine (TCM), cinnabar has a high therapeutic value. *Shennong's Classic of Materia Medica* claims that cinnabar can

treat all kinds of diseases in the five internal organs with a revitalizing and calming effect, build one's strength and improve acuity of vision, and kill evil spirits. Long-time consumption of cinnabar aids communication with the gods and leads to longevity.

A Discussion on Medicinal Attributes argues that cinnabar “produces a calming effect on the mind and is used to treat primarily people who are possessed by evil

² Located near present-day Huangshan, Shexian, and Xiuding of Anhui Province. See page 2941 of *Dictionary of Historical Place Names in China* edited by Shi Weile et al.

³ In present-day Nancheng County of Jiangxi Province. See page 1714 of *Dictionary of Historical Place Names in China* edited by Shi Weile et al.

spirits or who are in a spasm.” According to *Supplemental Records of Celebrated Physicians*, cinnabar “improves blood circulation, eases the mind, quenches thirst, boosts energy, brightens the face as well as cures stomach cramps and skin ulcer.” *Rihuazi’s Materia Medica* notes that cinnabar “can moisten the lung and heart as well as cure skin ulcer and polyps through a combination of oral administration and the external application.” *Compendium of Materia Medica* also notes that cinnabar can “cure convulsion and epilepsy, aid treatment of fetal toxicity and pox virus, prevent malaria, and induce perspiration.” All these suggest the continuous multiplication of the medicinal functions from the pre-Qin period and Qin-Han Dynasties through Ming-Qing Dynasties. Cinnabar was included in many remedies. For example, it was included in 36 formulas in *A Supplement to the Precious Formulas Worth a Thousand Gold*; these formulas were used for the treatment of gynecological diseases, pediatric diseases, typhoid, apoplexy, and carbuncle as well as for health and fitness in general. Ninety-six of the formulas in *Prescriptions of the Bureau of Taiping People’s Welfare Pharmacy* published in Song Dynasty includes the use of cinnabar for the treatment of apoplexy, typhoid, spleen and stomach diseases, phlegm and coughing, fever and diarrhea, eye diseases, skin ulcer and lump, gynecological diseases, pediatric diseases and so forth. *Shengji Compilation of Materia Medica Works* includes as many as 121 cinnabar prescriptions for the treatment of apoplexy, typhoid, malaria, coughing, hematemesis, dysphagia syndrome, varicella, heart ache, asthenia, liver, lung, and kidney diseases, skin ulcer and blister, eye diseases, oral disorder, gynecological and obstetric diseases, pediatric diseases, and other medical condition as well as for health and fitness in general. The rate of increase in the number of formulas also suggests continuous multiplication of the medicinal functions of cinnabar and its increased frequency of use. These formulas would typically use as much as dozens of Liang of cinnabar per order, which means that there was a great demand for cinnabar used for medicinal purpose alone, which provided the impetus for continuous growth of cinnabar mining.

In addition, in the use of traditional Chinese medicine, traditional Chinese physicians place much emphasis on “authenticity”; that is, they strive to use medicine of the highest quality from the best place of origin. A vertical historical review of the transformation of cinnabar localities reveals that the trajectory of such a transformation is implicitly consistent with this way of thinking in the medical field. During the pre-Qin Period and Qin-Han Dynasties, due to the limited development of medical science, there were no well-developed screening criteria for cinnabar selection, not to mention clear judgments of the quality of medicinal materials. Hence, the southeastern region of Yu, where the earliest mining activities took place, naturally became the center

of production. It was not until Wei, Jin, and the Southern and Northern Dynasties that medical expert gradually developed through practice a specific set of criteria for cinnabar classification. For instance, *Master Lei’s Discourse on Drug Processing* points out that “cinnabar should be distinguished carefully because its quality varies greatly from one kind to another and cannot be treated equally.” Master Lei divided cinnabar into dozens of classes based on its quality such as Miaoliu cinnabar, Meibai cinnabar, Baiting cinnabar, Shenzuo cinnabar, and Chenjin cinnabar; he also proposed the evaluation criteria for top-quality cinnabar: “only bright and crystal cinnabar can be placed in the category of top-quality cinnabar”. He has also pointed out that certain types of cinnabar such as Dou cinnabar and Mo cinnabar cannot be used as medicinal material due to the granules being coarse and oversized. These evaluation criteria listed in *Master Lei’s Discourse on Drug Processing* provided a useful frame of reference for the pursuit of high-quality cinnabar by subsequent generations of medical experts, which in turn contributed to the expansion and shift of the production center from Ba region to Xiangxi, Qianxi, and even Lingnan and other localities that produced better-quality cinnabar. Later, from Tang-Song Dynasties through Ming-Qing Dynasties, cinnabar classification became more detailed and cinnabar was more widely used in traditional Chinese medicine and pharmaceutical practices. Chinese materia medica works such as *The Newly Revised Materia Medica*, *Illustrated Materia Medica*, and *Compendium of Materia Medica* all illustrate Chinese traditional physicians’ advocacy of cinnabar of chen-jin at the time, which directly sped up the mining of cinnabar in Chenzhou, Jinzhou, and other nearby localities. Despite its high quality, cinnabar from Chenzhou and Jinzhou was mined in very limited quantities though, hence the discovery of many new localities. However, cinnabar found in these new localities either was suitable for merely external application but not for oral administration or could only be used for extracting mercury, which means that when it came to the use of cinnabar as medicinal material in ancient China, these localities were only supplemental and could by no means challenge the status of the Wuling-centered region of high-quality cinnabar production that had been in existence since Tang-Song Dynasties.

2.2 Society’s Demand for Cinnabar

Cinnabar had a wide range of functions in ancient China. Besides medical use as discussed previously, cinnabar could also be used as alchemy materials and pigment as well as for extracting mercury. Therefore, it was in high demand.

Alchemy was extremely popular in Wei, Jin, and the Southern and Northern Dynasties as well as Sui-Tang Dynasties. From emperors, generals, ministers, aristocrats, and officials to Taoist sorcerers and literati, everyone was

engaging in the trendy social activity of alchemy, which resulted in a great demand for cinnabar. Although such an enthusiasm for alchemy subsided a little from Song Dynasty on and through Ming-Qing Dynasties, it never disappeared.

Cinnabar is also a type of red pigment of high quality. It played an important role in ancient Chinese paintings and decoration. *Famous Paintings Through the Ages* mentioned “cinnabar from the wells in Wuling and Mocuo” (Zhang, 1964, p.37). The selection of cinnabar pigment reveals that ancient Chinese painters were very particular and they preferred cinnabar originating from Wuling, Mocuo, and other similar localities. Cinnabar pigments were also used a lot for decoration of imperial palaces in ancient China. Xie Chen, in his term as the prefectural chief of Wuling in Wu Kingdom during the Period of the Three Kingdoms once submitted the following piece to the emperor: “Construction of the new palace is now complete. I am presenting to your majesty 500 Jin of cinnabar to wish you longevity” (Li, 1994, p. 889). Even more astonishingly, hundreds of thousands of cinnabar was used to paint the walls of Tiance Palace outside of Xiaoxi gate, built under the order of Ma Xifan, the emperor of Nan Chu during the Period of the Five Dynasties (Sima, 1956, p.9241).

There was also a big demand for cinnabar for mercury extraction. Besides medicinal use, mercury was mostly used as a preservative. Many of the tombs of ancient aristocrats used mercury as a preservative. There are many historical records of emperors offering mercury to officials. For example,

in the 10th year of the reign of Emperor Xianchun, on March 20th, MS Hu with a posthumous title of Xianshou, who was the mother of Jia Sidao, passed way. Jia was granted a five-day leave from official duties as well as mercury and borneol, weighing 500 Liang each. (Zhou, 1991, p.95)

Another example is as follows:

In the 24th year of the reign of Emperor Shaoxing, the funeral of Zhang Jun, who was the Grand Preceptor and the Prince of Qinghe, was held. The emperor says that Zhang Jun was very diligent and therefore deserves to be treated differently from other officials of the same rank. Accordingly, Zhang’s family was granted a fancy court dress with expensive decorations, 200 Liang of mercury, and 150 Liang of borneol. (Tuotuo, 1977, p.2911)

Such documentations of the granting of mercury to honor the faithful and upright reoccurred frequently in historical records. The ratio of transmutation from cinnabar to mercury extracted with the technology of ancient China is 1 to between 0.6 and 0.7; the use of high-quality cinnabar may bring it up to 0.8. It can be seen accordingly that emperors also had a great demand for cinnabar so that they could grant it to honor their officials.

2.3 Attributes of Cinnabar as a Natural Resource

Cinnabar is a kind of mineral resource, which means that on the one hand, cinnabar deposits are fixed in

geographical location and cannot be arranged to grow in a designated natural environment in the same way as herbal plants, and on the other, the non-renewable nature of cinnabar determines that once it is processed, it cannot be recycled.

In ancient China, cinnabar was in high demand, used widely for medicinal or other purposes. The only way to meet the need for such large quantities of cinnabar was frequent mining. For example, in the reign of Emperor Dezong in Tang Dynasty, to meet the need for large quantities of cinnabar, Wei Congju, the prefectural governor of Xizhou took the liberty to add 1,000 jin of cinnabar and 200 tuo of mercury to regular taxes; as a result, cries of discontent rose all around (Liu, 1975, p.386). The “Monograph on Food and Merchandise” in the *History of Song Dynasty* noted an annual yield of 2200 jin of mercury in the year of Huangyou” and subsequently “an annual yield of over 2800 jin of mercury in the year of Zhiping” (Tuotuo, 1977, p.4524).

Such long-time extensive production almost completely depleted old cinnabar resources and resulted in the forced expansion into new localities. Take, as an example, Wuling valleys, which was the oldest cinnabar locality. The southeastern region of Yu was the first locality where large-scale mining took place, Baqing cinnabar mine being a representative example. Historical records show that this mine “remained profitable for several generations” (Sima, 1963, p.3260), which evidenced its long history. Later, in Wei, Jin, and the Southern and Northern dynasties, however, according to Tao Hongjing, “Fuling is the historical Fuzhou and located on the southern border of Ba Prefecture. It is no longer an active cinnabar mining site today.” This description reveals the scarcity of cinnabar resources in the southeastern region of Yu at the time. Although Su Shi noted that “from time to time herb pickers would find cinnabar there”, large-scale mining was no longer a possibility and the production center was shifting toward Chenzhou, Yuanzhou, and some other localities in the Xiangxi region. Further, materia medica works published in Song Dynasty state that “only a small amount of cinnabar was available” in Chenzhou and most of the cinnabar came from Xixu, Jinzhou, and some other regions of ethnic minorities, which suggests that due to depletion of cinnabar resources, the production center further shifted to present-day Qiandong region (Su, 1994, p.5). In Ming-Qing Dynasties, due to the advancement of technology and the demand of social economy, the scale of cinnabar mining increased, and there were numerous instances of cinnabar depletion in the present-day Qiandong region. For example, as noted in the “Monograph on Food and Merchandise” in the *History of Ming Dynasty*, “cinnabar and mercury mining only takes place in Dawan Mountain in Guizhou” (Zhang, 1974, p.1974). This one mining site had to fulfill the

need of the entire country; one can only imagine the large quantity of cinnabar produced there. Later, in Qing Dynasty, “Monograph on Food and Merchandise” in the *General History of Qing Dynasty* only includes the following description:

The Yongsha mine in Kaizhou of Guizhou should pay annual taxes of 1,269 jin of mercury in regular years and an additional amount of 133 jin in leap years; cinnabar mining sites in Wuchuan should pay annual taxes of 169 jin of mercury. In the first year of Emperor Kangxi, it was stipulated that the Doufu mine in Kaizhou of Guizhou was expected to pay annual taxes of 95 jin of mercury in regular years and an additional amount of 10 jin in leap years. The taxes paid would be converted to money as part of the military budget for Guizhou Prefecture. (*General History of Qing Dynasty*, p.78)

None of these descriptions mentioned the mining sites in Dawan Mountain; the Dawan mining sites, once well-known in Ming Dynasty, seemed to be no longer active. Yet even the newly popular mining sites were also in an embarrassing situation of resource depletion.

In the 38th year of the reign of the emperor, the two mining sites in Kaizhou, namely, Yongsha mine and Doufu mine, were having a severe shortage of cinnabar; mining had to be relocated to Hongbai caves in Xiuwen County. (*General History of Qing Dynasty*, p.78)

It can be seen that the attributes of cinnabar as a natural resource has undoubtedly played a dominating role in the development and transformation of cinnabar localities.

2.4 Cinnabar Mining Technologies

Unlike mining activities in modern days, which are aided by the use of various advanced instruments, the mining and extraction of cinnabar in ancient China faced a lot of challenges. Although cinnabar mining started as early as in the pre-Qin Period and even the period of primitive society (Archaeological team at Hemudu Site Ruins, 1980, p. 5), it was not until after Qin-Han Dynasties those ancient mining technologies entered a phase of rapid development. Many of the cinnabar resources mentioned in the *Legends of Mountains and Seas* were later proved to have actually existed in reality although due to limited mining technologies, these resources failed to be put to use. In Qin-Han Dynasties, the first unified country appeared in the history of China. On the one hand, the central government unified all measuring systems, developed communication and transportation, metallurgy, timber processing and other trades, all of which created favorable facilitative conditions for cinnabar mining. On the other, the pallet-style aven support method was widely used at the time, which was a key technology upon which mineral mining depended. Because “cinnabar mining always required several zhang of chiseling” (Tang, 1991, p.67), the pallet-style aven support method undoubtedly facilitated the mining of cinnabar. While relevant historical records are not available today, it can be inferred from an examination

on the mining of silver, copper, and other mineral resources at the time that cinnabar, which shared similar geological features with these minerals, should have been mined in a similar way.

The mining technologies of Qin-Han Dynasties were inherited and developed in Wei, Jin, and the Southern and Northern Dynasties and were further refined in Tang-Song Dynasties. In Song Dynasty in particular, the “fire-explosion” method was invented and widely used, which apparently improved the efficiency of cinnabar production. *Augmented Materia Medica* describes this method as follows: “First gather enough wood and start a fire around the mining vein. When the vein burst open, a small niche would appear with a white stone-like layer in the middle” (Kou, 1990, p.22). The book of *Xi Man Cong Xiao* also includes a similar description: “the best kind of cinnabar is obtained from the mines on the cliffs of Wan Mountain (part of the historical Jin Prefecture). Ethnic minority groups who live there use fire to get it” (Zhu, 1991, p.1). These are all vivid descriptions of the process of using the fire-explosion method to roast the mineral vein overnight until it disintegrates and becomes suitable for tool-aided mining. Cinnabar mines at the time are described by medical experts as follows: “a glimpse of cinnabar ore is not possible until dozens of chi deep in the mines”; “these mines are dozens of zhang deep”. The large size of the mines was the outcome of the development of mining technologies. What is also worthy of attention here is that mineral resources were an important pillar of government finance at the time. The rapid expansion of cinnabar localities in Song Dynasty was also attributable to government policies on mining administration. In Song Dynasty, the mines were administered by a special administrative agency, and a stand-alone “mine management system” was established. Administrative agencies near mines of a relatively large size were called “jian”; those near mines of a relatively small size were called “chang”. They were directly supervised by mining management chiefs. Many well-known cinnabar chang documented by historical records were located in Shangzhou and Yizhou. In those jian and chang, the government recruited many metallurgy practitioners to work there. Most of these practitioners were tramps; and the working conditions were very harsh.

In Ming-Qing dynasties, mining method, technology, and management have all been further perfected. The application of gunpowder in mine blasting in particular contributed to the increase of both the number of cinnabar localities and quantity of production. The mercury mine ruins in Wan Mountain of Guizhou are an illustrative example of the large amount of cinnabar production at the time. A large number of empty mining caves can be found at the ruins, the bigger ones of which are 20-30 meters high and 50-60 meters in length and width (Lu et al., 2007, p.201).

2.5 Religious and Cultural Functions of Cinnabar

Taoism is an indigenous religion in China; it originated from ancient legends of Chinese fairies. Taoists in ancient China were known for their unique and almost paranoid pursuit of cinnabar. For generations, Taoist alchemists regarded cinnabar as a holy object; they believed that it was the key to eternal life, hence their enthusiasm. For example, the famous alchemist Ge Hong made the following statement: “the longer you roast cinnabar, the better it becomes”; taking cinnabar orally “would bring eternal youth and eternal life” (Ge, p.14). Further, cinnabar is listed as an indispensable ingredient in famous formulas for precious medicines included in famous canons of elixirs. For example, it is listed as a primary ingredient in the formulas for elixirs of the fairies introduced in *Bao Pu Zi* written by Ge Hong.

Taoist alchemists were even more particular than traditional Chinese physicians about the quality of cinnabar. Yunmu cinnabar, Maya cinnabar and some other types of cinnabar that were only second to the top one kind of cinnabar called Guangming cinnabar were considered “not good enough for alchemy” by Taoist alchemists (*The Yellow Emperor’s Canon*, vol.13, p.51). Taoists believed that cinnabar “from the same prefecture or county should also be differentiated in quality; selection of quality cinnabar determines its ability to produce elixir of life”; that is to say, for them, the quality of cinnabar was key in directly determining whether the elixir made of it would be capable of extending one’s life to eternity. The famous canon of Tang Dynasty titled *The Yellow Emperor’s Canon of the Nine-Vessel Spiritual Elixir* includes the following observation: “although cinnabar originated from the regions of Ba and Chu, nowadays cinnabar from these two regions is not as good as what is produced in Mayang County of Chenzhou Prefecture” (*The Yellow Emperor’s Canon*, vol.13, p.51). Apparently, in Tang dynasty, Taoists were in favor of cinnabar from Mayang County, which was adjacent to Jinzhou Prefecture in geographic location and actually became part of Jinzhou in Song Dynasty. Such a change is consistent with the trajectory of the transformation of cinnabar localities, which illustrates the direct influence of the flourishing of Taoism at the time on the transformation of cinnabar localities.

Ling Wai Dai Da also mentioned that the radiation effect of Taoism contributed to cinnabar mining in Lingnan.

Ge Zhichuan once applied for the position of the governor of Goulou because he believed that fairy elixir was available there. Goulou is present-day Rongzhou of Guangxi, which suggests that cinnabar of Guangxi is superior to that of other places. (Zhou, 1999, p.271).

This narrative on the one hand illustrates the fact that Lingnan had been consistently producing high-quality cinnabar; on the other, it can also be inferred that Taoists like Ge Hong (also known as Ge Zhichuan) helped to

speed up cinnabar mining in Guangxi and change the distribution of cinnabar localities accordingly.

The so-called Taoist heavenly abodes and blessed locations listed in *Records of Famous Mountains Featuring Heavenly Abodes and Blessed Taoist Locations*, *Dong Yuan Ji*, and other Taoist canons were mostly cinnabar localities such as some of the top 10 heavenly abodes including Dayouxuming heavenly abode of Weiyu cave (Wuzhou), Taixuanzongzhen heavenly abode of Xicheng cave (Shuzhou), Sanxuanjizhen heavenly abode of Xixuan cave (Jinzhou), and Zhumingyaozhen heavenly abode of Luofu cave (Luofu Mountain of Xiuzhou) as well as some of the top 36 cave heavens including Jixuanyangming cave heaven in Kuaiji Mountain (Kuaiji County of Yuezhou), Guixuankezhen cave heaven in Guigu Mountain (Guixi County of Xinzhou), Taishangbaoxuan cave heaven in Duqiao Mountain (Rongzhou), Daxihuamiao cave heaven in Daxi Mountain (Chenzhou) and so on (Zhang, 2004, pp.81-83). These Taoist heavenly abodes and blessed locations attracted nearby Taoists, who built Taoist temples and used local resources to engage in alchemy, which in turn promoted the popularization and development of Taoism in these regions. Here, material base and superstructure became reciprocal: cinnabar resources promoted the popularization of Taoism in these regions while the development of the Taoist culture in turn sped up cinnabar mining. Thus it can be inferred that the radiation effect of Taoism and the development of cinnabar localities were mutually dependent.

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