



# Alternative Minerals– Potential for Guyana (Part 2)

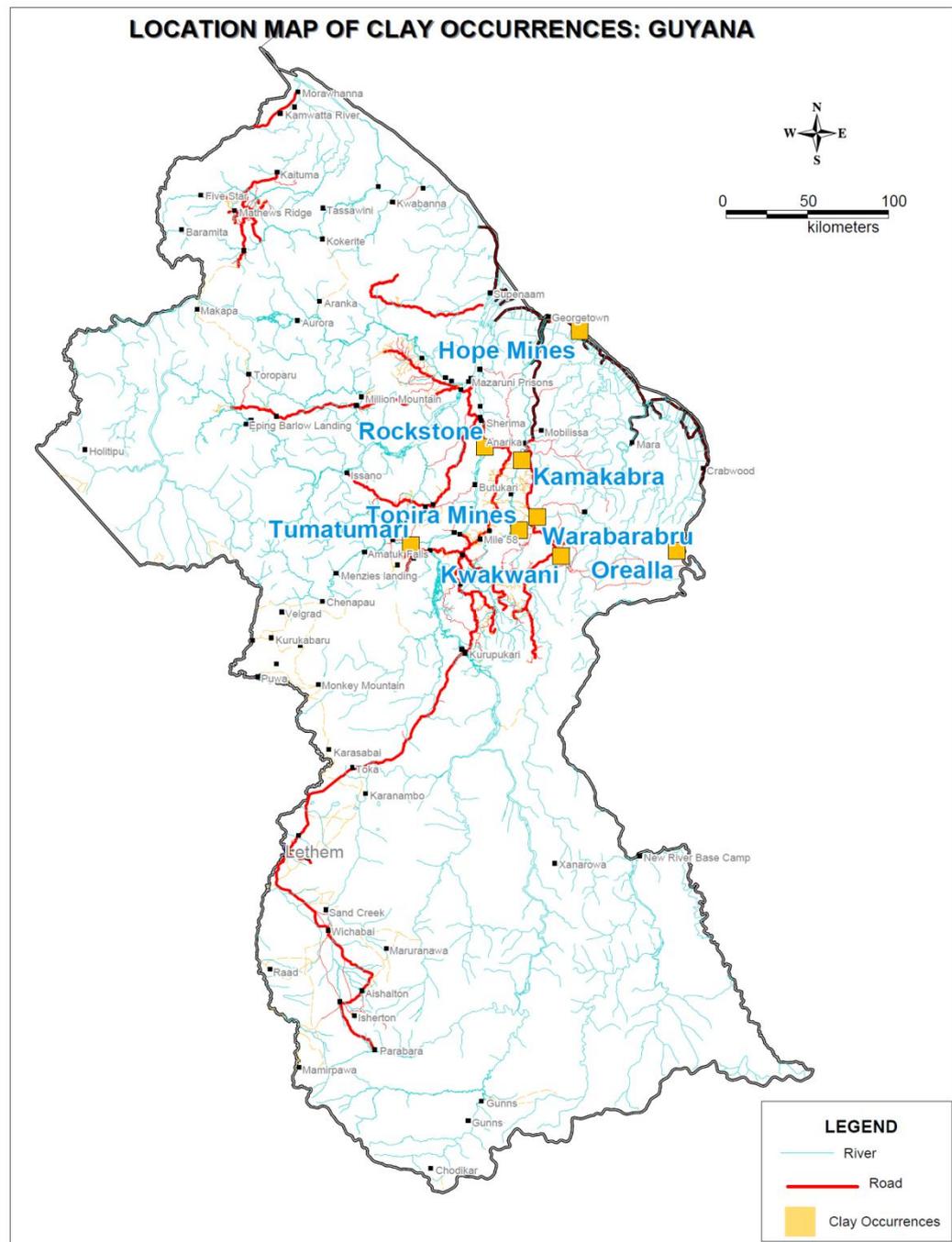
## 可替代矿产品-圭亚那的潜力股 (2)

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Commissioner,  
Guyana Geology and Mines Commission  
9<sup>th</sup> September 2014



# Clay Occurrences in Guyana

陶土矿在圭亚那的分布





# Chromite Facts and Information

## 铬铁矿的相关信息

- ▶ Chromite occurs in layered ultramafic intrusive rocks.
- ▶ 铬铁矿一般存在于层状镁铁质侵入岩
- ▶ It is found in metamorphic rocks such as some serpentinites.
- ▶ 在一些变质岩如蛇纹岩上也会发现铬铁矿
- ▶ Ore deposits of chromite form as early magmatic differentiates.
- ▶ 铬铁矿矿床是由岩浆早期分异而形成的
- ▶ Chromite occurrence was found in Coral Snake Creek of the Pomeroon River Head
- ▶ 铬铁矿的主要分布地在Pomeroon河的源头一处叫珊瑚蛇溪流的地方



# Chromite – Uses

## 铬铁矿的用途

- ▶ Chromite is used as a refractory material because it has a high heat stability.
- ▶ 铬铁矿可用作耐火材料，因为它的高热稳定性
- ▶ Chromite is used in chrome plating and alloying for production of corrosion resistant super alloys, nichrome, and stainless steel.
- ▶ 铬铁矿可用于为超合金，镍铬合金和不锈钢等产品抗腐蚀而进行的镀铬和炼制合金
- ▶ Chromium is used as a pigment for glass, glazes, and paint, and as an oxidizing agent for tanning leather.
- ▶ 铬可用作玻璃制品，釉料，涂料的天然色素，也可作为鞣制皮革的氧化剂



# Chromite - Uses

## 铬铁矿的用途



**Stainless Steel 不锈钢**



**Pigment for Glass 玻璃制品的天然色素**



# Mica Facts and Formation

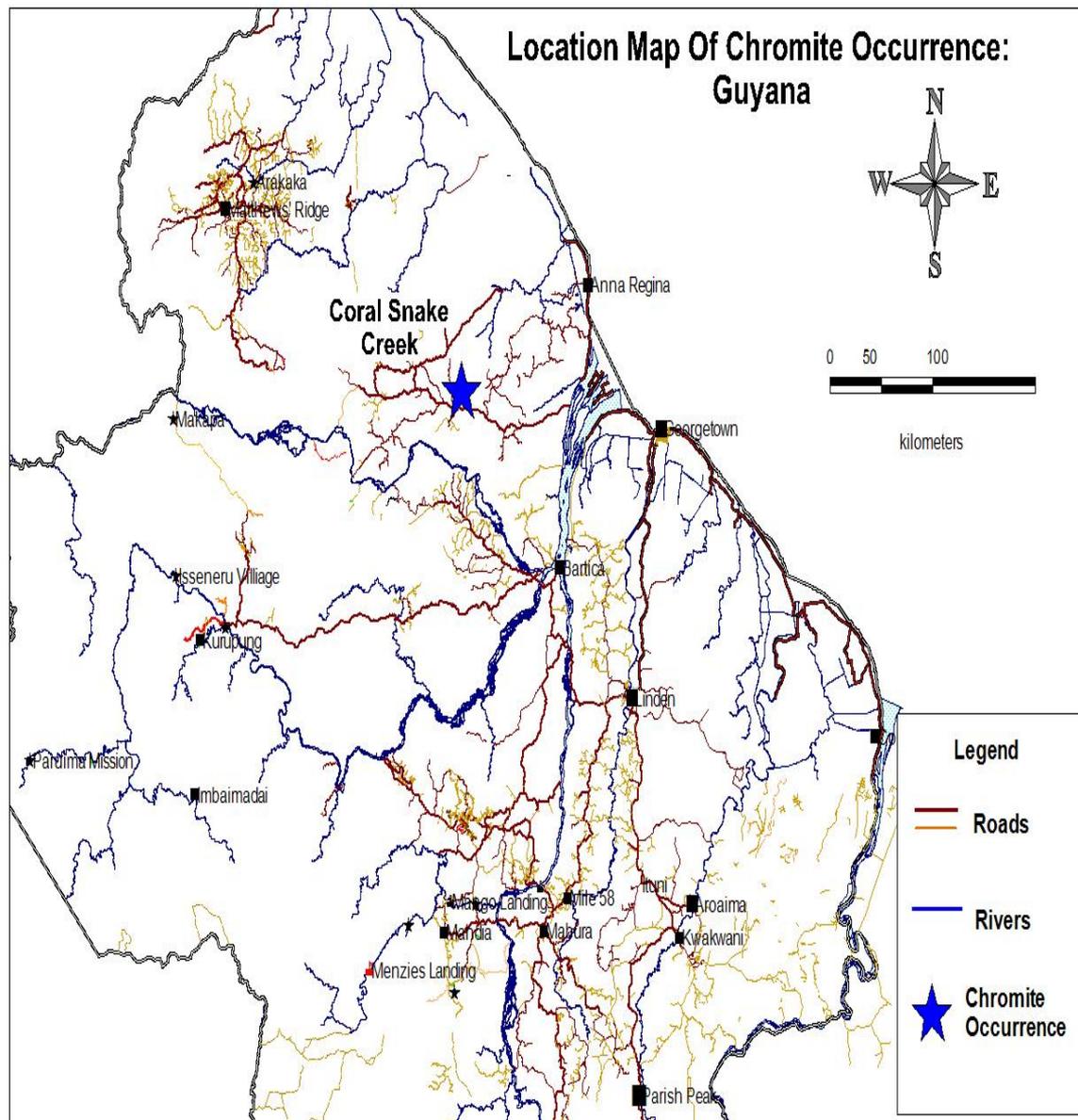
## 云母的形成

- ▶ Muscovite is the most common mica.
- ▶ 白云母是最为普遍的一种云母
- ▶ It is founded in granites, pegmatites, gneisses, and schists or as a secondary mineral resulting from the alteration of topaz, feldspar and kyanite.
- ▶ 它存在于花岗岩，伟晶岩，片麻岩和片岩中，或由于改变黄玉，长石和蓝晶石的性质而衍生成的一种次生矿石
- ▶ In pegmatites, it is often found in immense sheets that are commercially valuable.
- ▶ 它常在伟晶岩中以大量片状呈现，具有一定的商业价值。
- ▶ Mica occurrences were found in Moruka River Head and Kartabu Point.
- ▶ 云母在圭亚那的主要分布地：Moruka河的源头和Kartabu



# Chromite Occurrence in Guyana

## 铬铁矿在圭亚那的分布





# Mica – Uses

## 云母 的 用途

- ▶ Mica is stable when exposed to electricity, light, moisture, and extreme temperatures.
- ▶ 云母在与电，光线，水汽和极端气温接触时，会呈现极好的稳定性
- ▶ It is used in the electronic and electrical industries as insulators and capacitors
- ▶ 它作为绝缘体和电容器，可用在电子器件和电气行业中
- ▶ It provides increased resistance to water penetration and weathering, and brightens the tone of colored pigments
- ▶ 它可以加强对水渗透性和耐候性的阻力并有使颜料增光的效果
- ▶ It reduces cracking and chalking, prevents shrinkage and shearing of the paint film
- ▶ 它可减少裂缝和粉末化，防止漆膜收缩和受压



# Mica - Uses 云母 的用途



Electrical Insulators 电子绝缘体

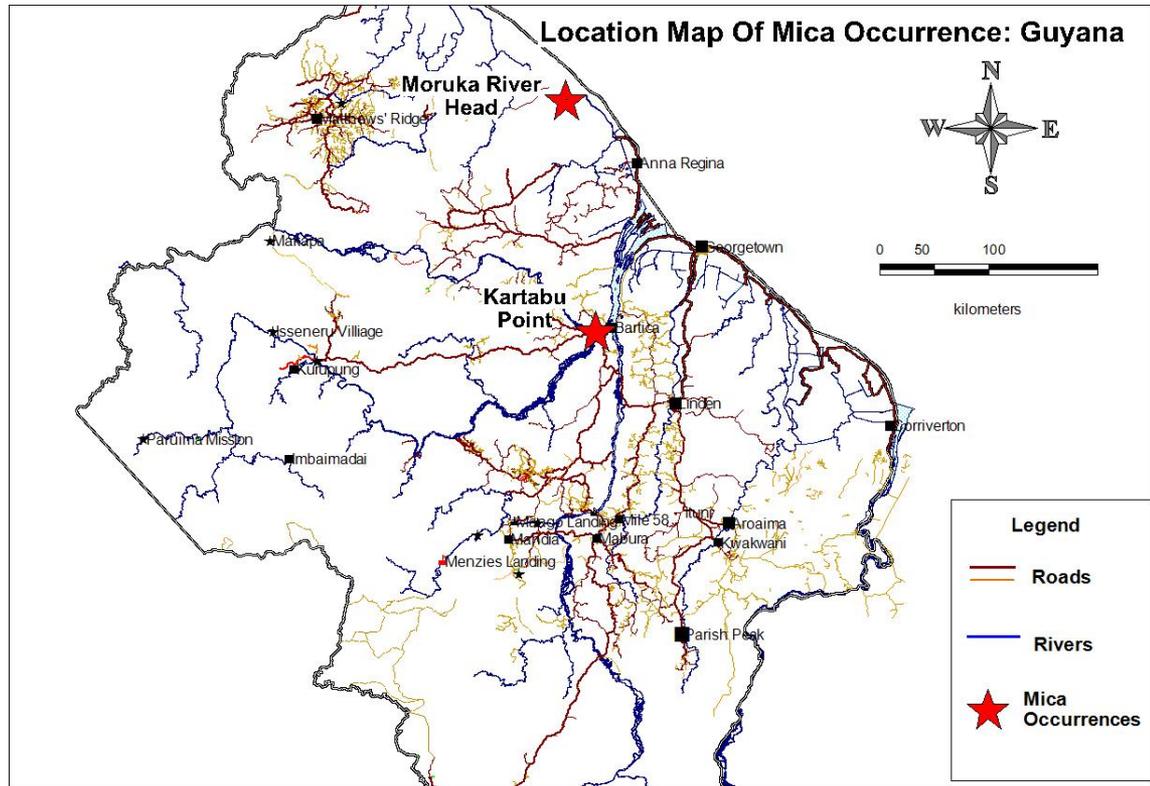


Colored Pigments 彩色颜料



# Mica Occurrence in Guyana

## 云母在圭亚那的分布





# Tin Facts and Formation

## 锡的形成

- ▶ Cassiterite(Sn) forms in high-temperature veins and usually related to igneous rocks such as granites and rhyolites.
- ▶ 锡矿形成于高温矿脉和火成岩上，例如：花岗岩和流纹岩
- ▶ When rocks containing cassiterite (Sn) are weathered the cassiterite tends to remain intact, and eventually is concentrated in streams to form “placer” occurrences
- ▶ 当含有锡石晶体的岩石遭遇风化后，锡石晶体会保存完好，最后富集在溪流中形成冲击矿床
- ▶ Tin occurrence was found in Potaro River Area Mowasi River Area and the Kuyuwini Granites
- ▶ 锡在圭亚那的分布主要有：Potaro河流域，Mowasi河流域和库尤维尼花岗岩



# Cassiterite (Tin) – Uses

## 锡的用途

- ▶ Tin takes a high polish and is used to coat other metals to prevent corrosion
- ▶ 锡可磨得很光，可用作其他金属的涂层以防止腐蚀
- ▶ Alloys of tin are important, such as soft solder, pewter, bronze and phosphor bronze.
- ▶ 锡合金也具有重要的作用：如软焊料，白蜡，青铜，锡磷青铜
- ▶ The most important tin salt used is tin(II) chloride which is used as a reducing agent.
- ▶ 锡盐的最重要用途是制作氯化锡，它可用作还原剂。
- ▶ Tin salts sprayed onto glass are used to produce electrically conductive coatings.
- ▶ 锡盐还可喷洒在玻璃上，可用于生产导电镀膜
- ▶ Most window glass is made by floating molten glass on molten tin to produce a flat surface.
- ▶ 多数的窗户玻璃由融合了液态锡的浮法玻璃制作而成，以形成平整的表面
- ▶ Recently, a tin–niobium alloy that is super–conductive at very low temperatures has attracted interest.
- ▶ 近来，一种具有在非常低的温度下形成的超导材料–锡铌合金备受关注

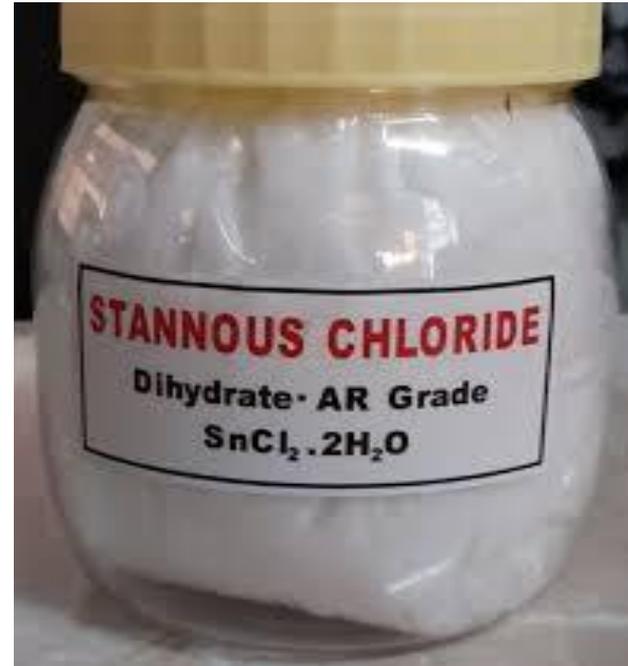


# Cassiterite (Tin) – Uses

## 锡的用途



For its High Sheen (Luster)  
闪闪发光的锡器

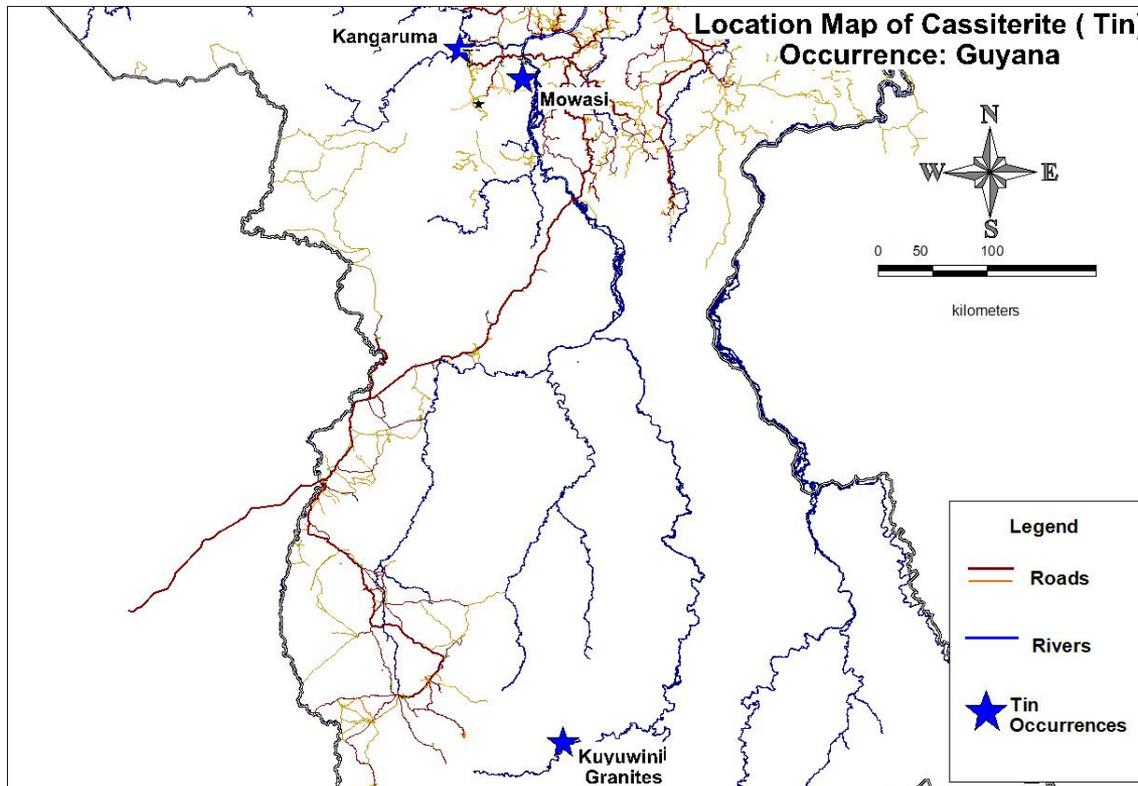


Reducing Agent  
还原剂



# Tin Occurrence in Guyana

## 锡矿在圭亚那的分布地





# Copper Facts and Formation

## 铜的形成

Generally, greenstone belts host economical deposits of many metals, including gold, manganese, uranium and copper.

总体来说，绿石带一般都富集多种有经济价值的金属矿床，包括黄金，锰，铀和铜

Groete Creek copper occurrence is associated with the interbedded metasedimentary and metavolcanic *rocks*.

铜矿分布与变质碎屑岩的夹层有关



# Copper – Uses

## 铜的用途

- ▶ The major applications of copper are as follow:
- ▶ 铜主要应用于以下方面：
  - Electrical wires and Electronic components (60%).
  - 电线和电子元件
  - Roofing and plumbing (20%)
  - 建筑物屋顶和管道系统
  - Industrial machinery (15%).
  - 工业机械
  - Copper alloy (5%)
  - 铜合金

# Copper – Uses

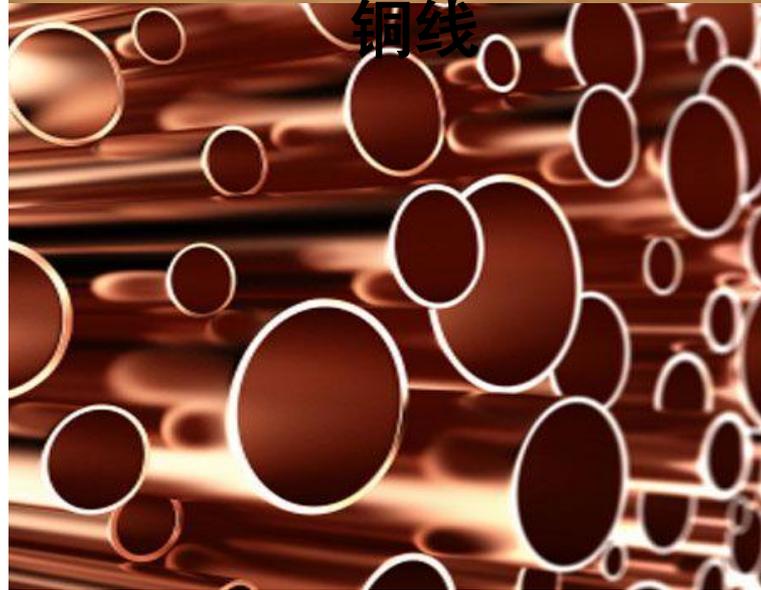
## 铜的用途



Electrical  
铜线



Alloy of Zinc and Copper  
锌铜合金



Copper Tubes  
铜管





# Iron Facts and Formation

## 铁的形成

- ▶ Iron ore potential in Guyana can be separated into two main types:
- ▶ 圭亚那铁矿石资源潜力主要可分成两种类型：
  - Lateritic deposits 含有红土的矿床
  - Non-lateritic deposits 不含有红土的矿床
- ▶ Non lateritic iron ore can be separated in two types: 不含红土的铁矿石又可分成两种类型：
  - Banded iron formations and 条带状含铁构造
  - Possible magmatic derived magnetite deposits containing titanium. 火山岩浆衍生出含有钛金属磁铁矿床



# Iron – Uses

## 铁的用途

- ▶ The major applications of Iron are as follow:
- ▶ 铁矿主要应用于以下几个方面：
  - Buildings and Highway construction.
  - 房屋和道路建设
  - Vehicle Manufacturing
  - 汽车制造
  - Industrial Machinery
  - 工业机械
  - Household and Institutional Furnishing
  - 家庭和办公家具
  - Pharmaceuticals
  - 制药
  - Recreational facilities
  - 娱乐设施



# Iron - Uses 铁的用途



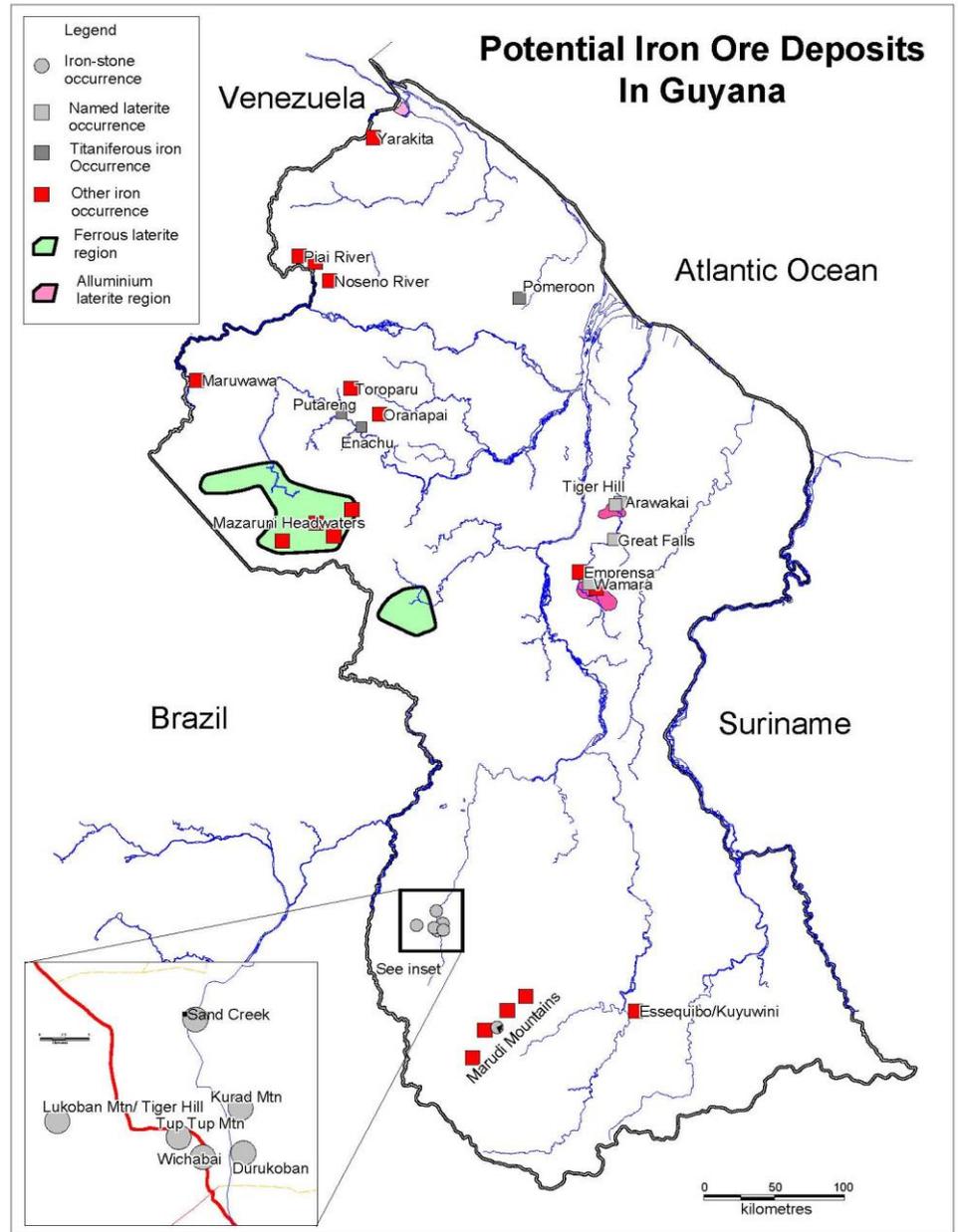
In Construction Industry  
用于建筑行业

In Recreational Sport  
(Golf Club) 休闲体育 (高尔夫球杆)



# Iron Occurrence in Guyana

## 铁矿在圭亚那的分布





# Amethyst – Facts and Formation

## 紫水晶的形成

- ▶ Amethyst is a purple variety of quartz ( $\text{SiO}_2$ ) and owes its violet color to irradiation, iron impurities (in some cases in conjunction with transition element impurities), and the presence of trace elements, which result in complex crystal lattice substitutions.
- ▶ 紫水晶是由多种紫色石英形成的。其紫罗兰颜色归因于它的放射功能，微量元素的出现，可导致复杂的晶体置换。
- ▶ Amethyst occurs in primary hues from a light pinkish violet to a deep purple. Amethyst may exhibit one or both secondary hues, red and blue.
- ▶ 紫水晶的原色调是从淡淡的粉红色到深紫色。紫水晶也可呈现一到两种间色，红或/和蓝

# Pictures showing Amethyst in Guyana 圭亚那的紫水晶



Location :Rupununi : Dadanawa ranch and Aishalton Village

**Best Field Indicator**  
最佳指标 :

Hardness硬度 : 7

Colour颜色 : Violet or purple 紫罗兰色或紫色

\*\*\* Note: Hardness: 1 is lowest and 10 is highest. 硬度以1为最低, 10为最高



# Amethyst – Uses

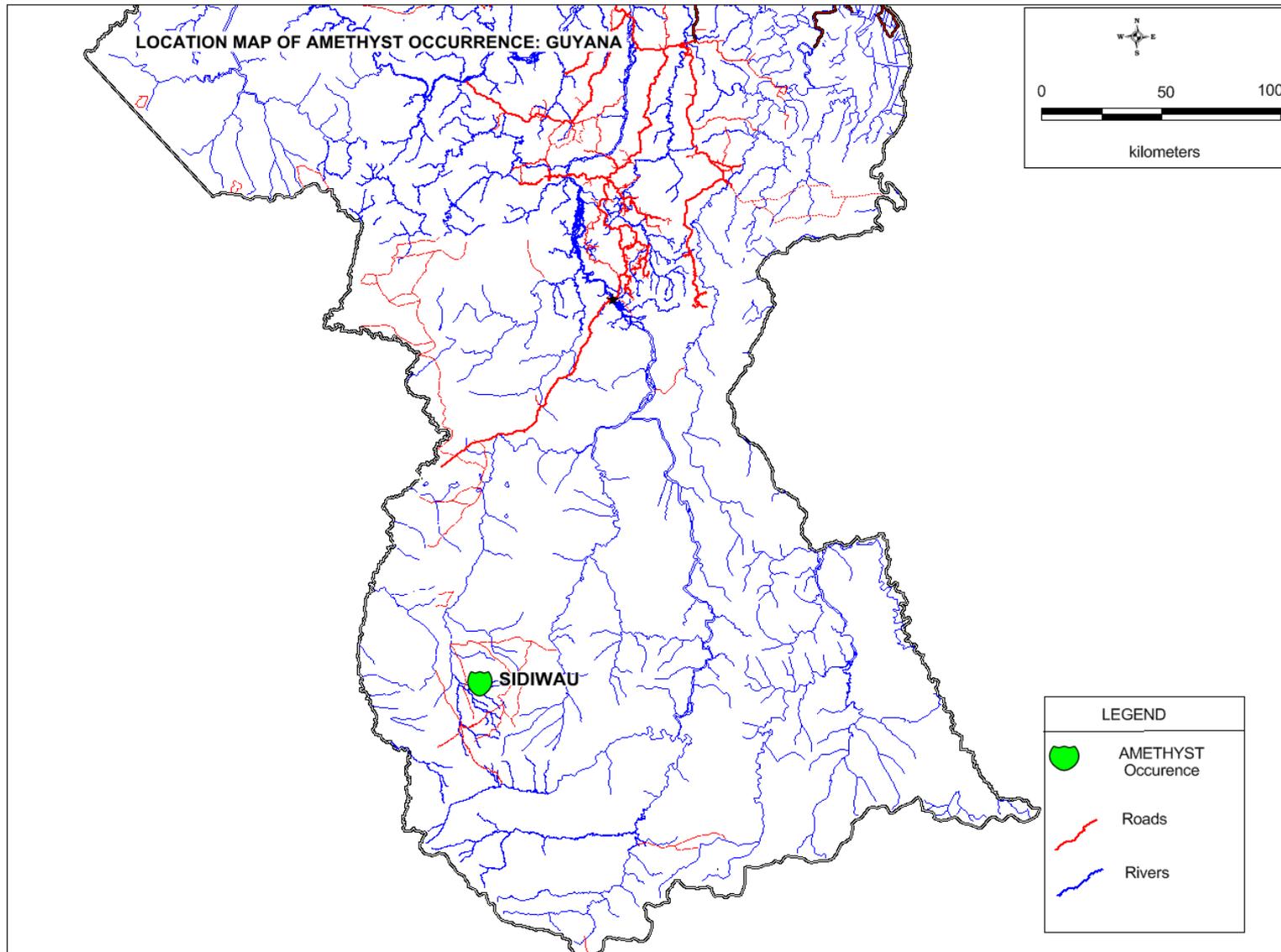
## 紫水晶的用途

- ▶ Manufacturing of watches and handbags.
- ▶ 手表和坤包的制作
- ▶ Manufacturing of counter tops.
- ▶ 台面板的制作
- ▶ Amethyst generates far-infrared radiation.
- ▶ 紫水晶产生远红外线辐射
- ▶ Amethyst generates negative ion emission.
- ▶ 紫水晶可排放负离子
- ▶ Amethyst is used as gemstones in Jewelry.
- ▶ 紫水晶可用在珠宝首饰的制作上
- ▶ Amethyst is used protection, and healing stones.
- ▶ 紫水晶还可用于制作护身符，同时它还是药用石
- ▶ Amethyst is used in the manufacturing of drinking vessels and massage tools.
- ▶ 紫水晶还可制作成酒具和按摩工具



# Map of Guyana showing Amethyst Location

## 圭亚那紫水晶的产地分布图





# Amethyst - Uses 紫水晶用途





# Agate – Facts and Formation

## 玛瑙的形成

- ▶ Agate– is a cryptocrystalline variety of silica, chiefly chalcedony, characterized by its fineness of grain and brightness of color.
- ▶ 玛瑙是一种隐晶体石英，主要是由玉髓构成，以色泽明亮和质地精细为其特点
- ▶ Although agates may be found in various kinds of rock, they are classically associated with volcanic rocks and can be common in certain metamorphic rocks
- ▶ 尽管玛瑙存在于多种岩石中，但它们多与火山岩有关，同时在某些变质岩中也时常有它们的存在
- ▶ Most agates occur as nodules in volcanic rocks or ancient lavas, in former cavities produced by volatiles in the original molten mass, which were then filled, wholly or partially, by siliceous matter deposited in regular layers upon the walls.
- ▶ 多数的玛瑙以矿物结核的形式存在于火山岩或古老的火山熔岩中。它是由原熔体中的挥发物形成的前期岩石洞孔，被沉积在岩壁常规层上的硅质物全部或部分地填充，最后形成玛瑙。



# Agate – Facts and Formation

## 玛瑙的形成

- ▶ Agate has also been known to fill veins or cracks in volcanic or altered rock underlain by granitic intrusive masses.
- ▶ 玛瑙也被确知在火山岩或蚀变岩中它起填充纹理和填补裂缝的作用
- ▶ Such agates, when cut transversely, exhibit a succession of parallel lines, often of extreme tenuity, giving a banded appearance to the section.
- ▶ 这样的玛瑙，当它们被横切开后呈现出带状横纹及一连串极细的平行线
- ▶ Such stones are known as banded agate, riband agate and striped agate.
- ▶ 这些石头被称作条纹玛瑙，丝带玛瑙和斑纹玛瑙

# Pictures showing Agates found in Guyana

## 圭亚那境内发现的玛瑙



**Location: North Rupununi: Ireng River around Sunnyside**

**Best Field Indicator :** Hardness : 7

**Colour :** White to grey, light blue, orange to red, black.

**Structure :** Regular layers / Bands

**\*\*\* Note: Hardness: 1 is lowest and 10 is highest.**



## Agate- Uses 玛瑙用途

- ▶ Uses: jewellery, counter tops, bookends, wind chimes, and other decorative items.
- ▶ 用途：珠宝，台面，书挡，风铃及其他点缀物





# Agates location in Guyana

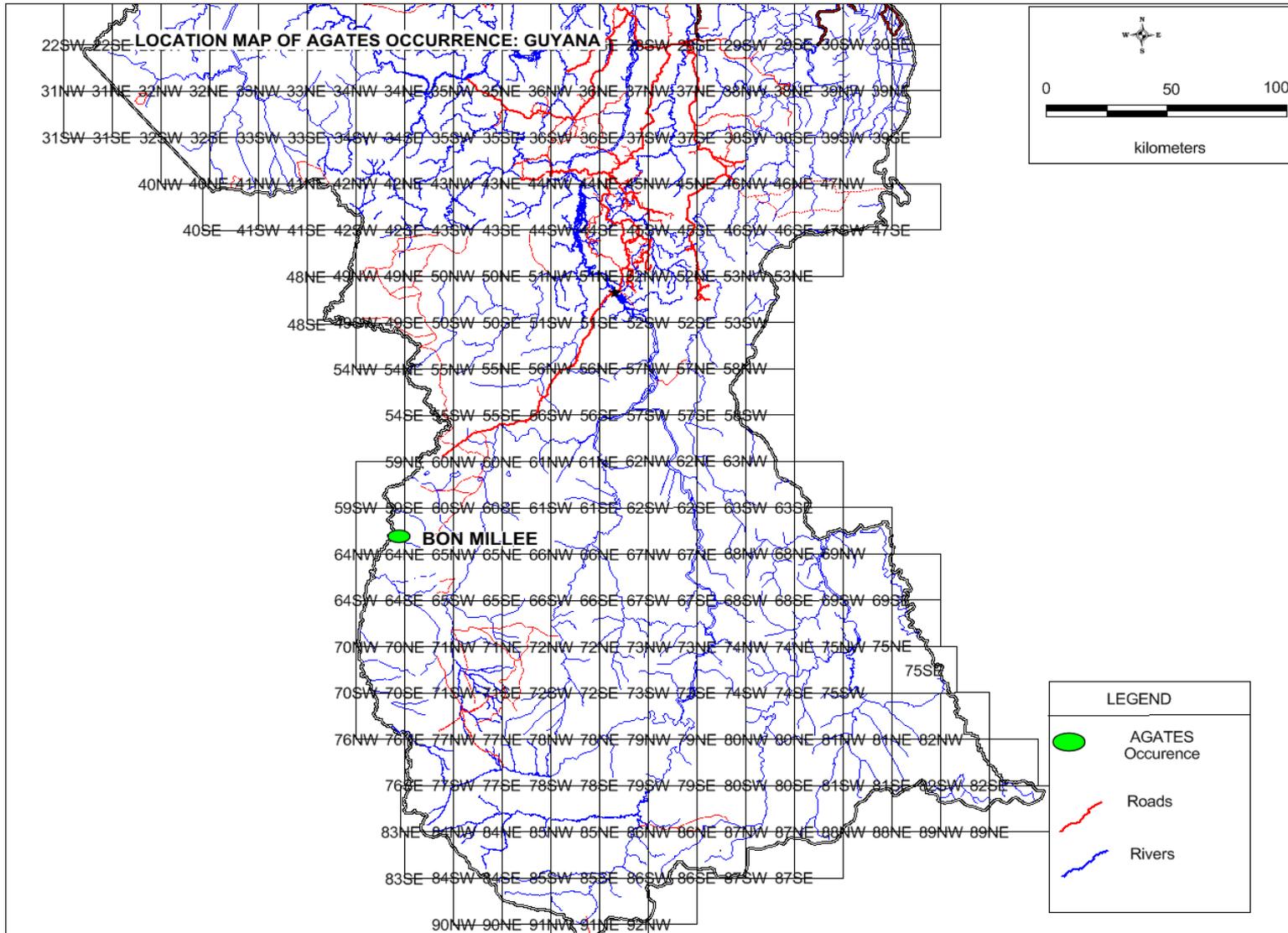
## 玛瑙在圭亚那的分布

- ▶ Deposits of banded and fire agate occur in the North Rupununi savannahs in the southwest of Guyana.
- ▶ 条纹玛瑙和火玛瑙的矿床分布在圭亚那西南部鲁普努尼大草原以北地区
- ▶ The best deposits are found in Bon Millee on an old terrace of the left bank of the Ireng River in the North Rupununi savannahs, approximately 31 miles north of Lethem.
- ▶ 品质最佳的矿床发现于勒瑟姆以北大约31英里的北鲁普努尼大草原上的伊伦河左岸一处叫Bon Millee的古老阶地。
- ▶ Likewise in a gravel bed deposit at Sishwa, 4 miles down the Ireng River from Bon Millee.
- ▶ 同样的一块矿床发现在伊伦河下游4英里的Sishwa



# Map of Guyana showing Agate location

## 圭亚那玛瑙分布地





# Rose Quartz Facts and Formation

## 芙蓉石的形成

- ▶ Quartz is the second most abundant mineral in the Earth's continental crust, after feldspar. It is made up of a continuous framework of  $\text{SiO}_4$  silicon-oxygen tetra-hedra, with each oxygen being shared between two tetra-hedra, giving an overall formula  $\text{SiO}_2$ .
- ▶ 石英是地球大陆地壳中除长石外第二丰富的矿物。它的结构是硅氧四面体，通过共用氧，连成网络，而且每个氧原子都被两个四面体所共用。
- ▶ Rose quartz is a type of quartz which exhibits a pale pink to rose red hue. The color is usually considered as due to trace amounts of titanium, iron, or manganese, in the massive material.
- ▶ 芙蓉石是石英的一种，呈现一种由淡淡的粉色到玫瑰红的色调。这种色调一般被认为是由于石头中含有微量的钛，铁或锰等金属元素所致。



# Rose Quartz Facts and Formation

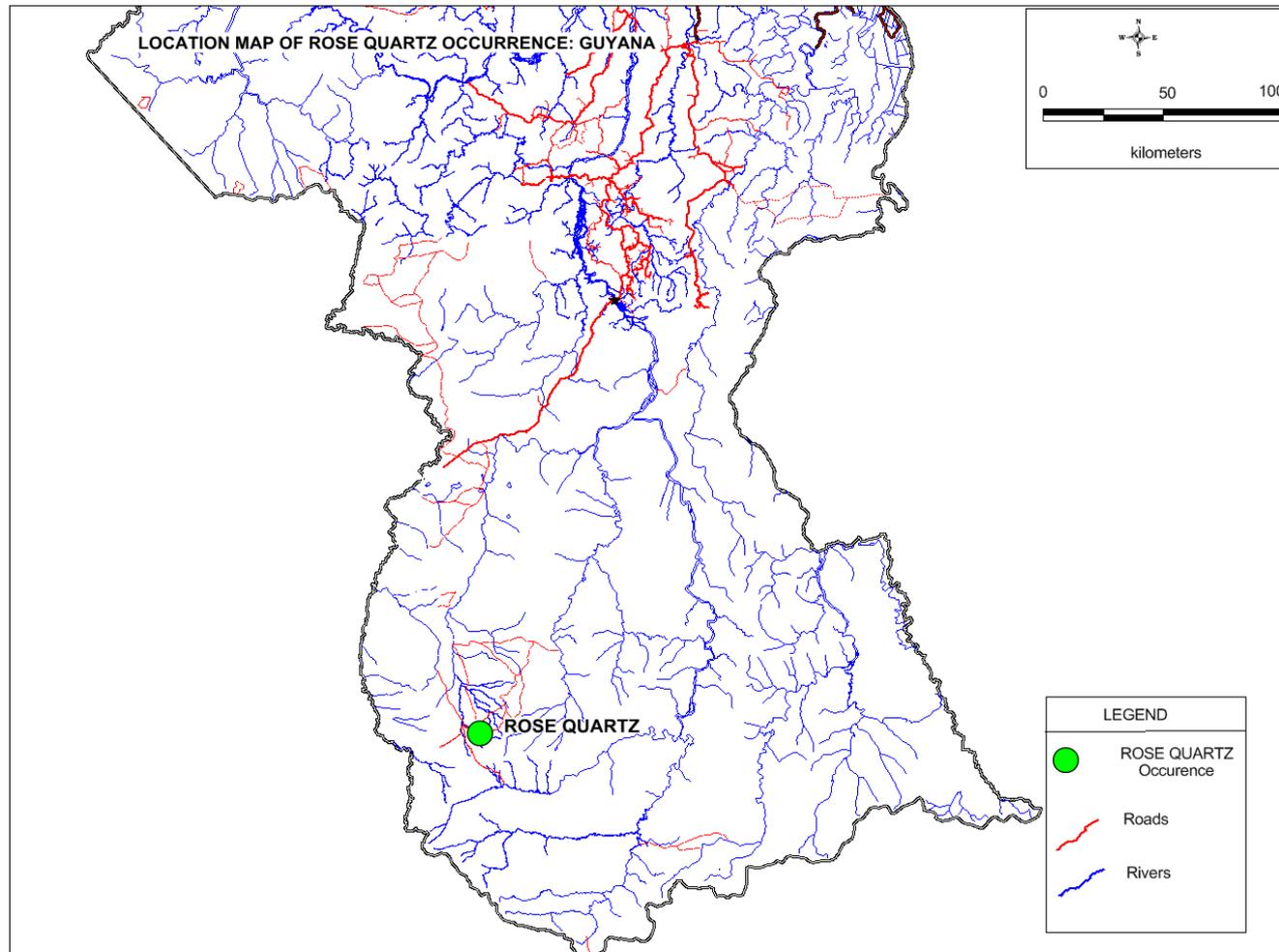
## 芙蓉石的形成

- ▶ Some rose quartz contains microscopic rutile needles which produces an asterism in transmitted light. Recent X-ray diffraction studies suggest that the color is due to thin microscopic fibers of possibly dumortierite within the massive quartz.
- ▶ 一些芙蓉石内含极微小的金红石针叶，其在光线传导的情况下可呈现星状光彩。近期的x光衍射研究表明石英中可能含有的蓝线石，它有许多极其细微的纤维从而呈现出上述色彩。
- ▶ Rose quartz is a type of quartz which exhibits a pale pink to rose red hue. The color is usually considered as due to trace amounts of titanium, iron, or manganese, in the massive material.
- ▶ 芙蓉石是石英的一种，呈现一种由淡淡的粉色到玫瑰红的色调。这种色调一般被认为是由于石头中含有微量的钛，铁或锰等金属元素所致。
- ▶ Rose quartz is usually very evenly colored.
- ▶ 芙蓉石的着色一般都非常均匀。



# Map of Guyana showing Rose Quartz location

## 芙蓉石在圭亚那的分布图





# Pictures showing Rose Quartz found in Guyana

## 圭亚那所发现的芙蓉石



Location : Dadanawa Ranch area of South Rupununi

**Best Field Indicator :**

**Hardness : 7**

**Colour : Clear crystals of quartz with pink to reddish pink**



# Rose Quartz- Uses

## 芙蓉石的用途

- ▶ Rose quartz has been used as a gemstone and as other ornamental and religious objects.
- ▶ 芙蓉石可用来制作宝石和其他装饰品以及宗教法器





# Green Quartz Facts and Formation

## 绿石英的形成

- ▶ Green Quartz is clear to opaque and coloured by a variety of minerals including Iron, nickel, copper, chlorite and actinolite.
- ▶ 绿石英可从透明到不透明，颜色因其内含的矿物属性而各有不同。这些矿物属性有铁，镍，铜，海绿石和阳起石。
- ▶ Green-quartz or vermarine is a green form of quartz, a silicate mineral chemically silicon dioxide. Prasiolite is one of several quartz varieties.
- ▶ 绿石英是一种绿色为底色的石英，通常材料是二氧化硅。绿水晶是石英变种后的一种
- ▶ Green quartz is sometimes incorrectly called green amethyst.
- ▶ 绿石英有时被错误叫做绿水晶
- ▶ True Green Quartz is fairly rare.
- ▶ 真正的绿石英相当稀少。



# Green Quartz- Uses

## 绿石英的用途

- ▶ Green quartz has been used as counter tops, jewelry, gemstone and as other ornamental and religious objects.
- ▶ 可用于制作台面，珠宝，宝石及其他装饰品或宗教法器。

