



# Alternative Minerals–Potential for Guyana (Part 3)

## 可替代矿产品-圭亚那的潜力股（3）

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



Picture showing Green Quartz found in Guyana  
圭亚那境内发现的绿石英



Location: Torres Hill Near Aishalton, South Rupununi

**Best Field Indicator :**

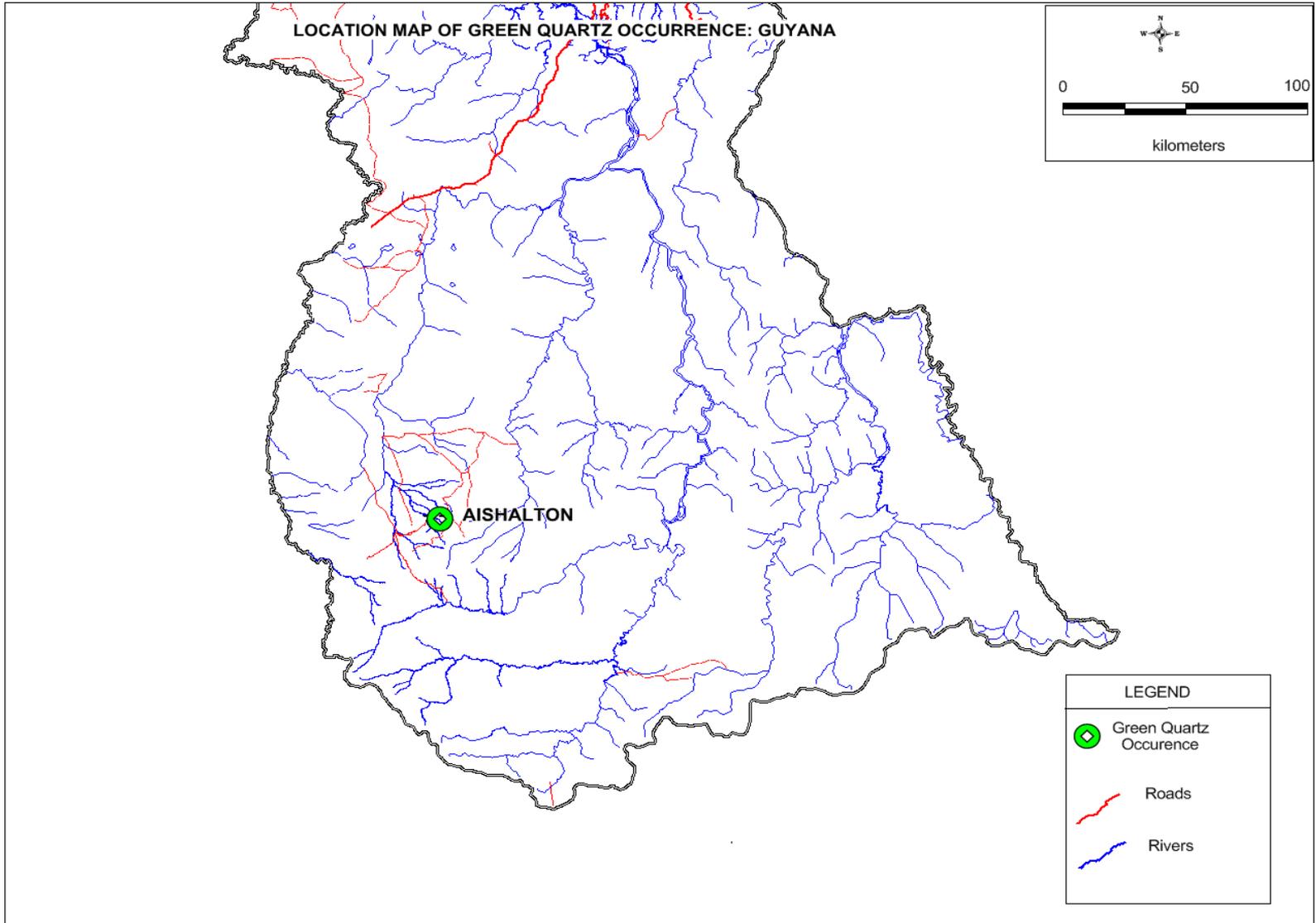
**Hardness : 7**  
**Colour : Green, light green**  
**Streak : White**

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



# Map of Guyana showing Green Quartz location

## 圭亚那绿石英产地分布图





# Jasper – Facts and Formation

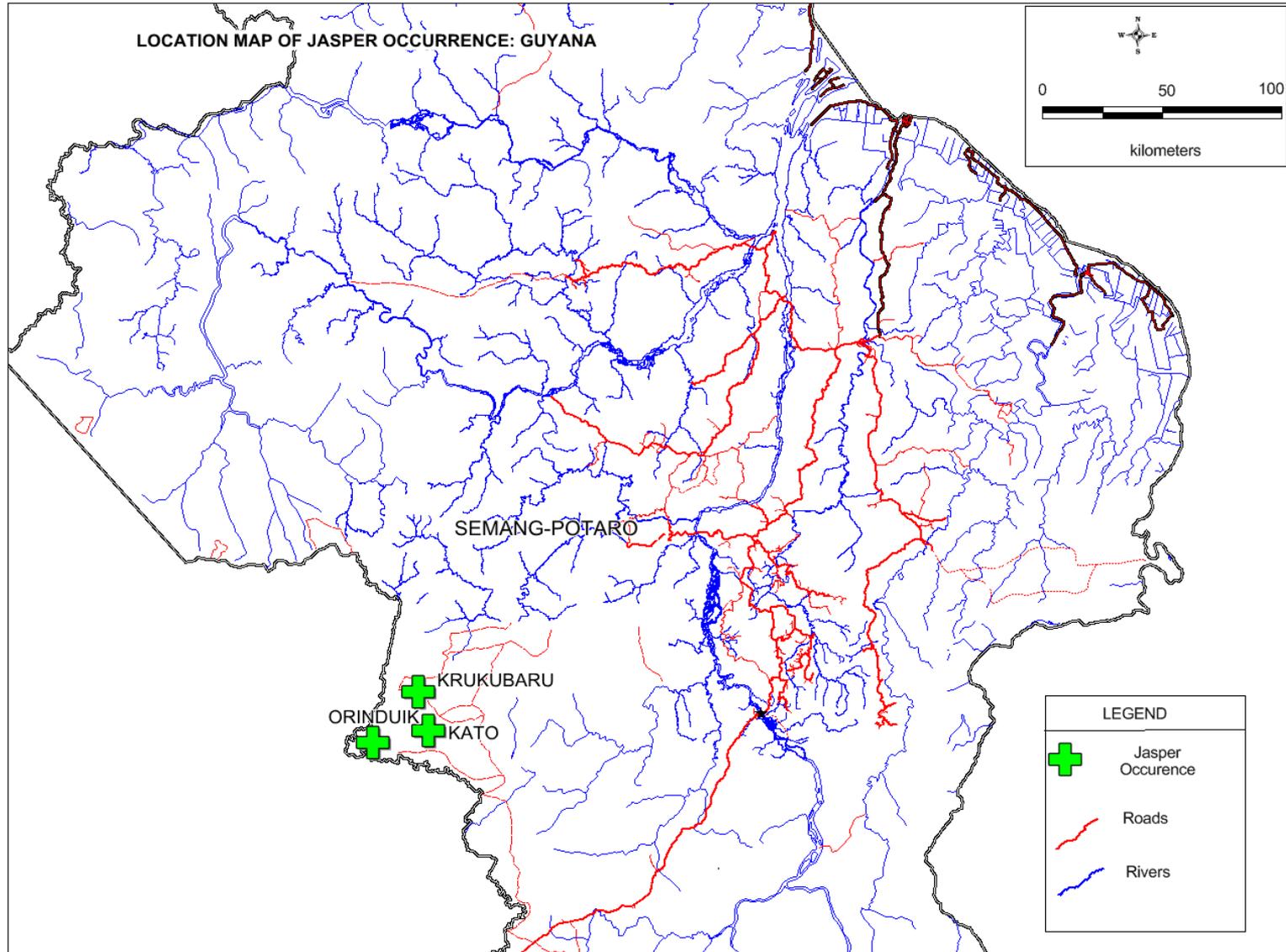
## 碧玉的形成

- ▶ Jasper is a dense, opaque, microcrystalline variety of Quartz. Fibrous and grainy varieties of Quartz are often grouped together and referred to as Chalcedony, though Jasper's microcrystals are laid out in large, sugar-like grains rather than the fibrous layers of Chalcedony or Agate.
- ▶ 碧玉是一种密度大，不透明，微晶质的石英变体。纤维状和木纹状的石英变体经常会交融在一起，称为玉髓。碧玉的微晶体多以大颗，糖状晶粒分布而不是分布在玉髓或玛瑙的纤维层上。
- ▶ It occurs in nodules or as fillings in fissures and may be found all over the world, in nearly every color. Jasper is colored by oxides of iron and known for its deep earthy tones of red, yellow, brown and green, sometimes in shades of blue or purple, and displays wonderful contrasts in its banding, inclusions, "pictures," and small circular patterns.
- ▶ 碧玉在世界范围内以各种颜色出现，它以矿瘤状物或石头裂缝中的填充物存在于矿石中。碧玉可被铁的氧化物着色，呈现出深泥土色调，已知以红色，黄色，棕色及绿色为多。有时也会有蓝色或紫色。碧玉的条纹，内含物，图像及环形形状都呈现出绝妙的反差之美。



# Map of Guyana showing Jasper location

## 碧玉在圭亚那的分布图





# Pictures showing Jasper found in Guyana 圭亚那境内发现的碧玉



Location: Near Orinduik Falls (Pakaraima Mountains)

**Best Field Indicator :**

**Hardness : 6.5 to 7**

**Colour : Red, Yellow or Brown**



# Jasper - Uses

## 碧玉用途

- ▶ Jasper is primarily used today as ornamental jewelry used to create sculptures, construction and ornaments.
- ▶ 碧玉主要作为装饰性珠宝，用于制作雕塑，装饰物或建筑物上。





## Rutile – Facts and Formation 金红石的形成

- Rutile is the most common form of titanium dioxide. Rarer polymorphs include Brookite and Anatase, both which also form unique and distinctive crystals.

金红石是二氧化钛最普遍的组成形式。它也是比较罕见的多晶体，包括板钛矿和锐钛矿。两种矿石都可组成独特的水晶

- Rutile is a mineral that comes in a surprising contrast of distinct habits and colors, making it a fascinating mineral.
- 金红石是一种有着独特特性和颜色的矿石，因此人们对它也就格外着迷
- Rutile has multiple unique crystal forms as well as several telltale colors, styles, and associations.

金红石具有多重独特晶形以及多种颜色，样式和关联



## Rutile – Facts and Formation 金红石的形成

- ▶ It ranges from mirror-like metallic lustered crystals, to dark reddish sub-metallic crystals, to bright golden-yellow needles.
- ▶ 金红石的晶形各异，从光滑如镜的金属光泽水晶到深红色亚金属水晶，再到金黄色针状晶形
- ▶ Even the opaque metallic-looking forms are somewhat translucent on edge under backlighting, with a dark red translucent tinge.
- ▶ 即便是不透明的金属晶形，灯光投射其边缘，可见深红色半透明的色调
- ▶ Rutile comes in several different environments, including plutonic and intrusive igneous rocks and granites, metamorphic gneiss and schists, carbonatites, regional metamorphic schists, and hydrothermal replacement deposits.
- ▶ 金红石产生于多种环境之下，包括火成岩，侵入式火山岩和花岗岩，变质片麻岩，片岩，碳酸盐岩，区域性变质片岩和热液置换沉积物。



# Pictures showing Rutile 有关金红石的照片





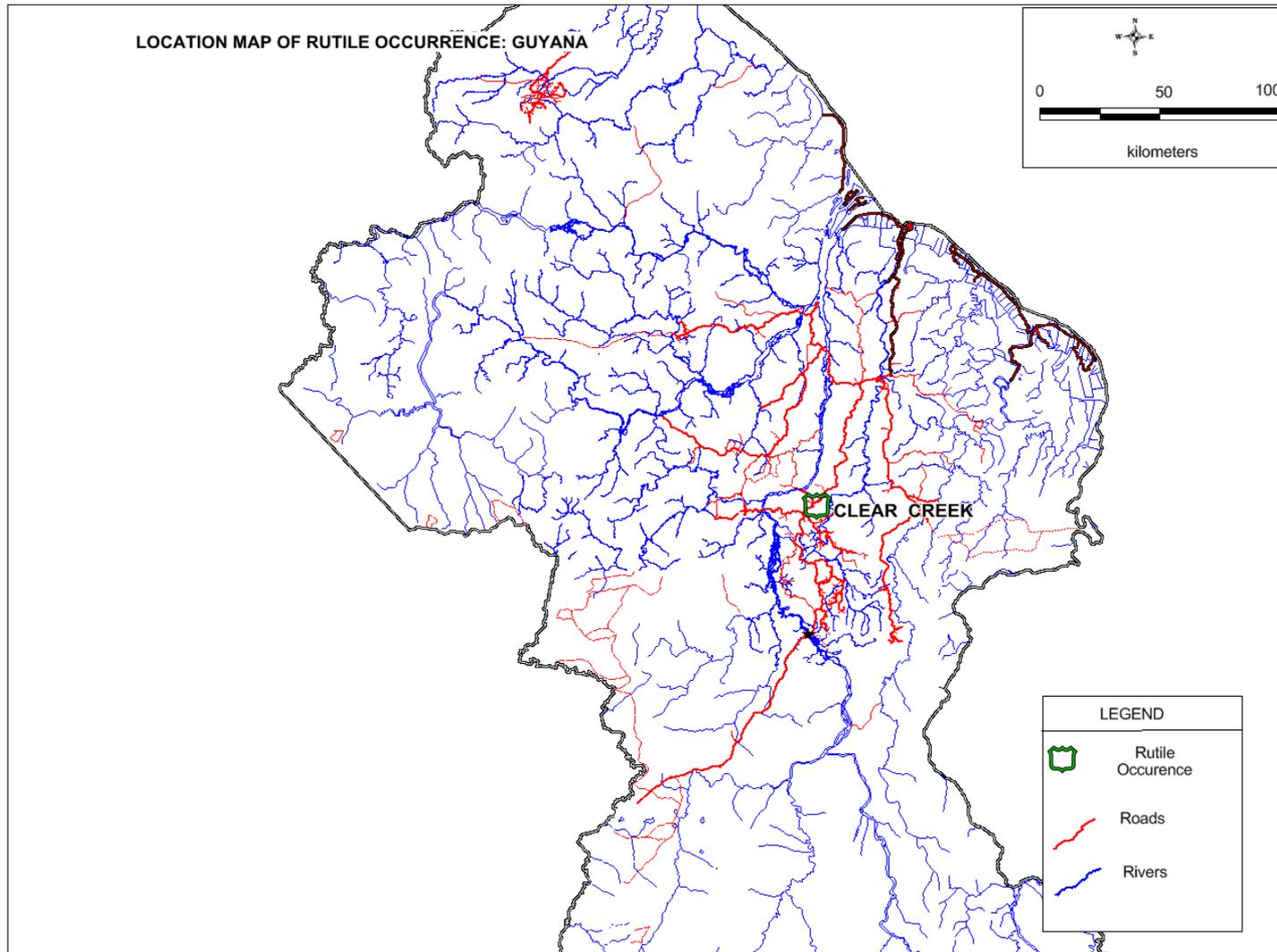
# Rutile - Uses 金红石用途

- ▶ Welding rods 焊条
- ▶ Jewellery 珠宝
- ▶ Paints 油漆





# Map of Guyana showing Rutile location 圭亚那金红石的分布图





# Black Pearl – Facts and Formation

## 黑珍珠的形成

- ▶ The Black Pearl, originally Wicked Wench, is a fictional ship in the Pirates of the Caribbean film series. In the screenplay, the Black Pearl is easily recognized by her distinctive black hull and sails.
- ▶ 黑珍珠号是电影系列片《加勒比海盗》中的虚拟的一艘海盗船。在剧本中，黑珍珠号凭借其独特的黑色船体和船帆，让人很容易分辨。
- ▶ Black Pearl beads of high quality, famed for their roundness, high luster and the eye-catching silver jewelry creations they produce when set in rings, earrings, pendants and much more.
- ▶ 高质量的黑珍珠串珠，以其圆润，亮泽而闻名。当它被镶嵌在戒指，耳环，吊坠等金银首饰上时就显得格外悦目，夺人眼球。
- ▶ Black pearl beads can be drilled and strung or pasted on to jewelry mounts.
- ▶ 可在黑珍珠串珠上钻孔，扎绳或将其镶在珠宝托架上



# Black Pearl – Uses

## 黑珍珠用途

- ▶ Jewelry 珠宝
- ▶ Cosmetics 化妆品



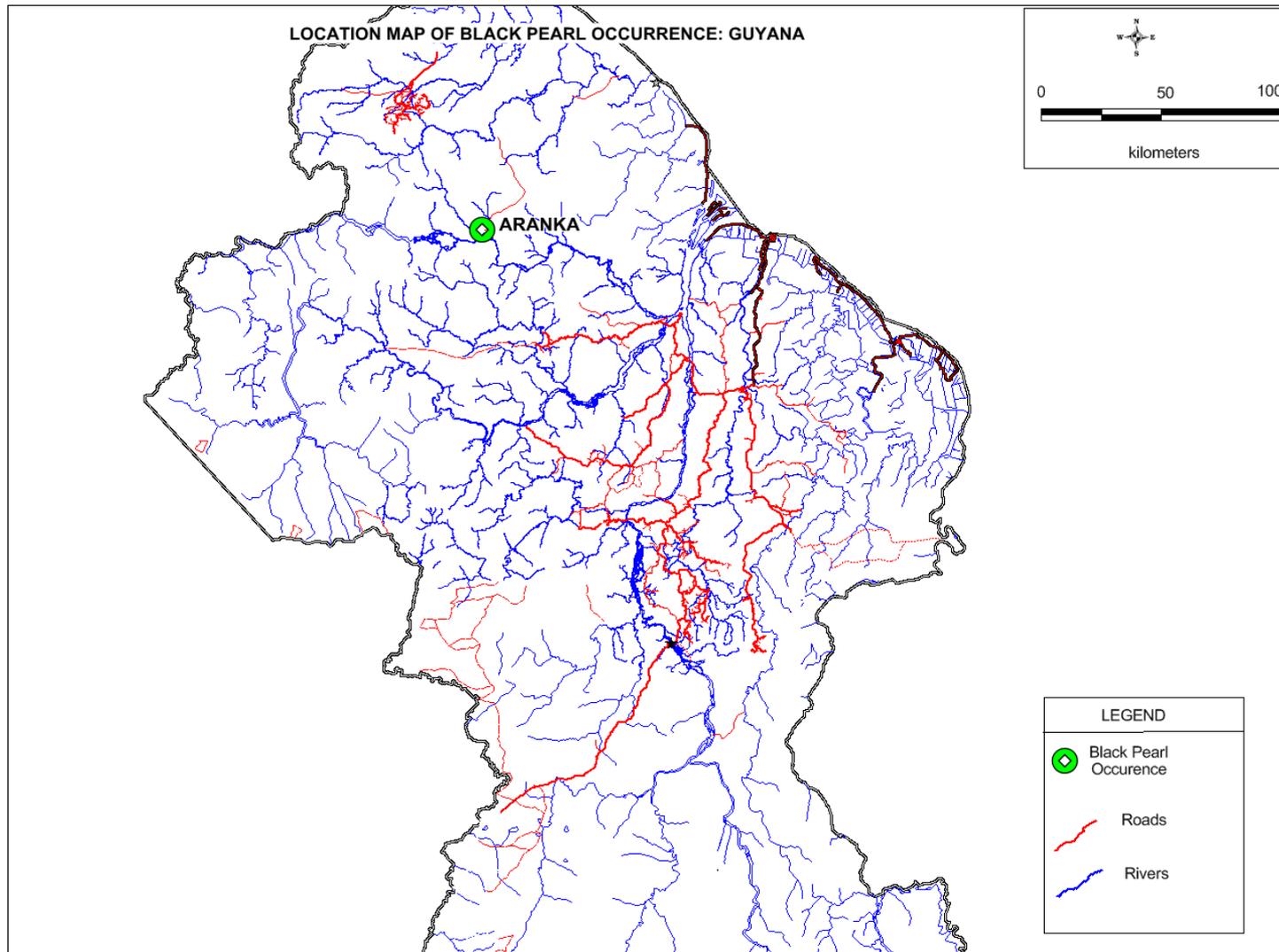
# Pictures showing Black Pearl 有关黑珍珠的照片





# Map showing Black Pearl location in Guyana

## 圭亚那境内黑珍珠分布图





# RARE EARTH ELEMENTS

## 稀土元素

Z	ELEMENT	SYMBOL	USE
21	Scandium	Sc	Aerospace framework, high-intensity street lamps, high performance equipment
39	Yttrium	Y	TV sets, cancer treatment drugs, enhances strength of alloys
57	Lanthanum	La	Camera lenses, battery-electrodes, hydrogen storage
58	Cerium	Ce	Catalytic converters, colored glass, steel production
59	Praseodymium	Pr	Super-strong magnets, welding goggles, lasers
60	Neodymium	Nd	Extremely strong permanent magnets, microphones, electric motors of hybrid automobiles, laser
61	Promethium	Pm	Not usually found in Nature
62	Samarium	Sm	Cancer treatment, nuclear reactor control rods, X-ray lasers
63	Europium	Eu	Color TV screens, fluorescent glass, genetic screening tests
64	Gadolinium	Gd	Shielding in nuclear reactors, nuclear marine propulsion, increases durability of alloys
65	Terbium	Tb	TV sets, fuel cells, sonar systems
66	Dysprosium	Dy	Commercial lighting, hard disk devices, transducers
67	Holmium	Ho	Lasers, glass coloring, High-strength magnets
68	Erbium	Er	Glass colorant, signal amplification for fiber optic cables, metallurgical uses
69	Thulium	Tm	High efficiency lasers, portable x-ray machines, high temperature superconductor
70	Ytterbium	Yb	Improves stainless steel, lasers, ground monitoring devices
71	Lutetium	Lu	Refining petroleum, LED light bulbs, integrated circuit manufacturing

(Z = Atomic Number)

- Elements 29, 61 = Rare Earths
- Elements 57 - 60, 62 = Light Rare Earth Elements
- Elements 39, 63 - 71 = Heavy Rare Earth Elements

## A LIST OF ALL RARE EARTH ELEMENTS



# USES AND FACTS

## 稀土用途

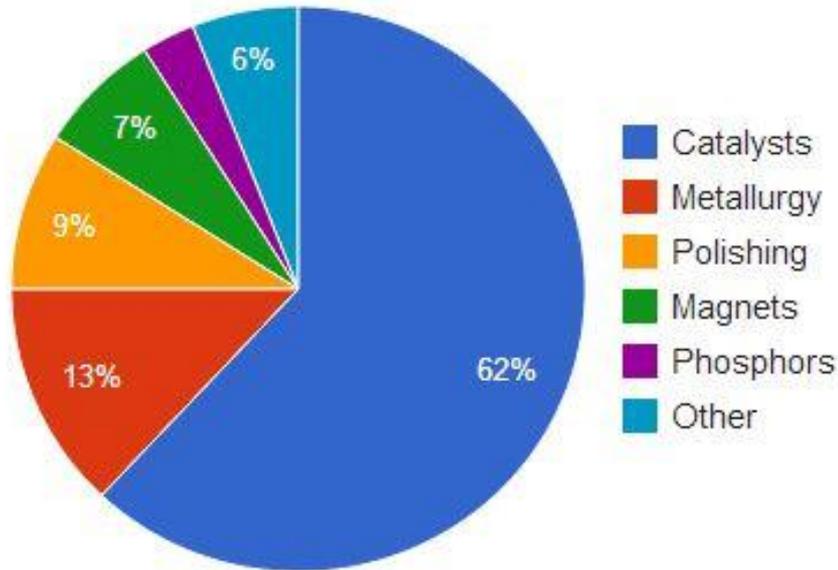
- ▶ Many rechargeable batteries are made with rare earth compounds.
- ▶ 许多充电电池是用稀土元件制作而成的
- ▶ Demand for the batteries is being driven by demand for portable electronic devices such as cell phones, readers, portable computers, and cameras.
- ▶ 对于电池的需求推动了人们对便携式电子设备的需求，例如：手机，阅读器，便携式电脑，照相机等
- ▶ Several pounds of rare earth compounds are in batteries that power every electric vehicle and hybrid-electric vehicle.
- ▶ 电池中几磅的稀土化合物可给每台电动汽车，混合动力车提供电力。
- ▶ Rare Earth Elements make the world's strongest permanent magnets, these magnets are utilized in electric motors
- ▶ 稀土元素产生世界上最强的永久性磁铁，这些磁铁可被利用在电动马达上
- ▶ Rare earths are used as catalysts, phosphors, and polishing compounds. These are used for air pollution control, illuminated screens on electronic devices, and the polishing of optical-quality glass.
- ▶ 稀土可被用作催化剂，荧光粉和抛光剂。它们可用在治理空气污染，电子设备上的照明玻璃屏以及光学玻璃的抛光



# USES AND FACTS

## 稀土的用途

### Uses of Rare Earth Elements

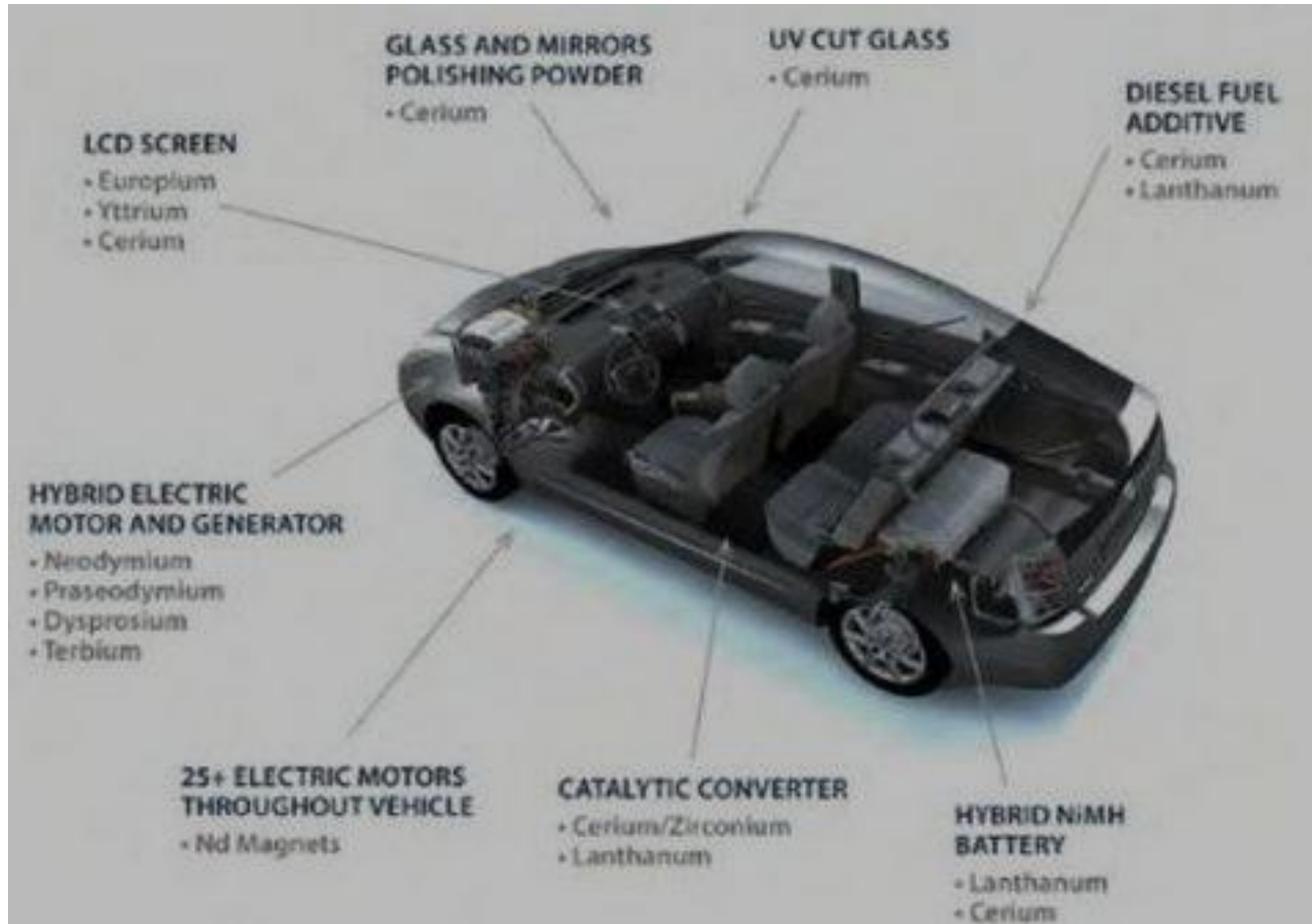


USES IN THE USA AS REPORTED BY THE UNITED STATES GEOLOGICAL SURVEY MINERAL COMODITY SURVEY, 2012

REF: <http://geology.com/articles/rare-earth-elements/>



## USES OF REEs 稀土元素用途

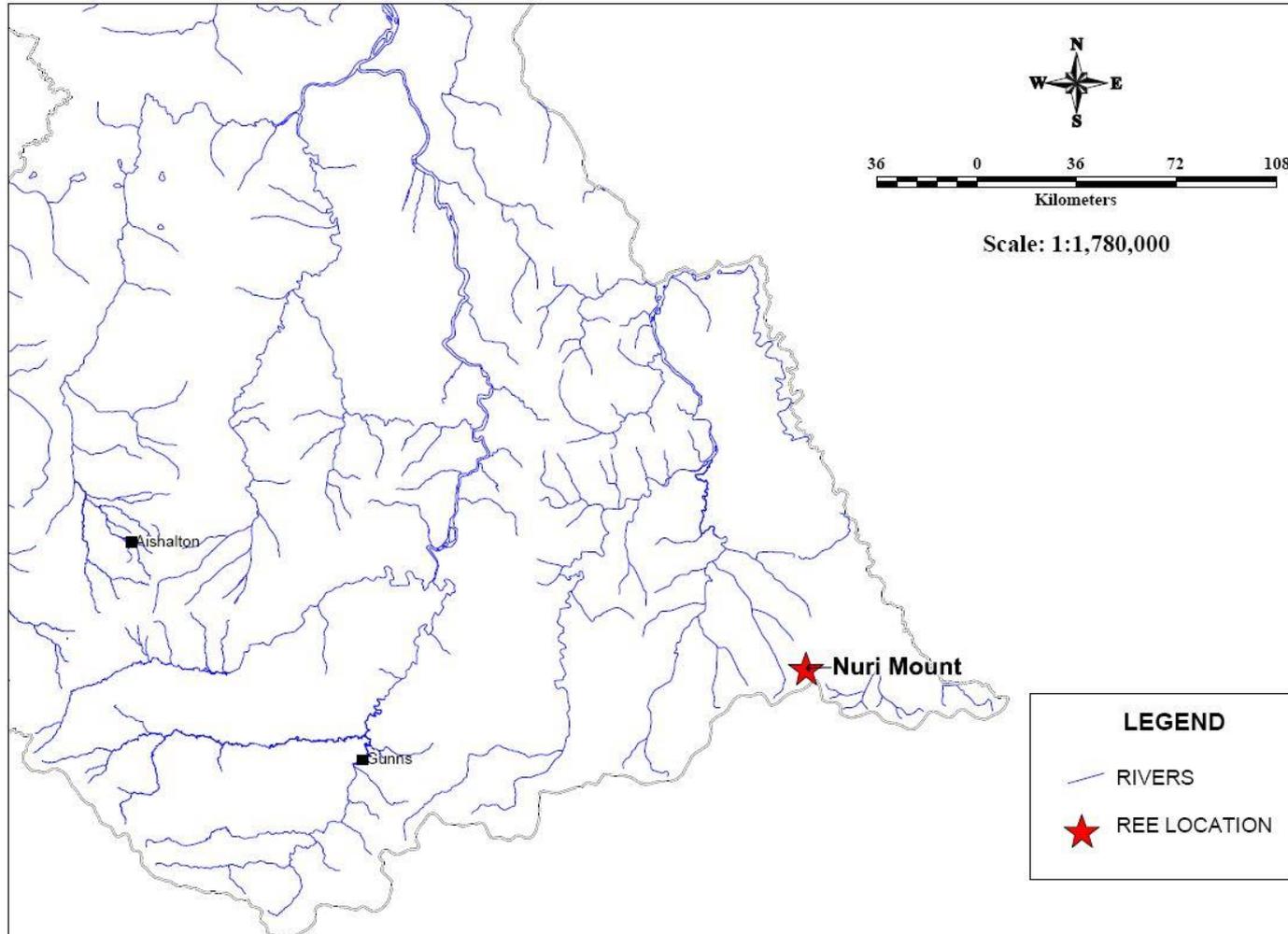


RARE EARTH ELEMENTS ARE USED EXTENSIVELY IN HYBRID CARS  
稀土元素广泛使用在混合动力车上



# PROBABLE REE OCCURANCE IN GUYANA

## 圭亚那境内稀土元素分布图





# PEAT 泥炭土



PEAT IS USED TO MAKE ORGANIC COMPOST FOR AGRICULTURAL PURPOSES

泥炭土被制作成有机肥料，服务于农业生产



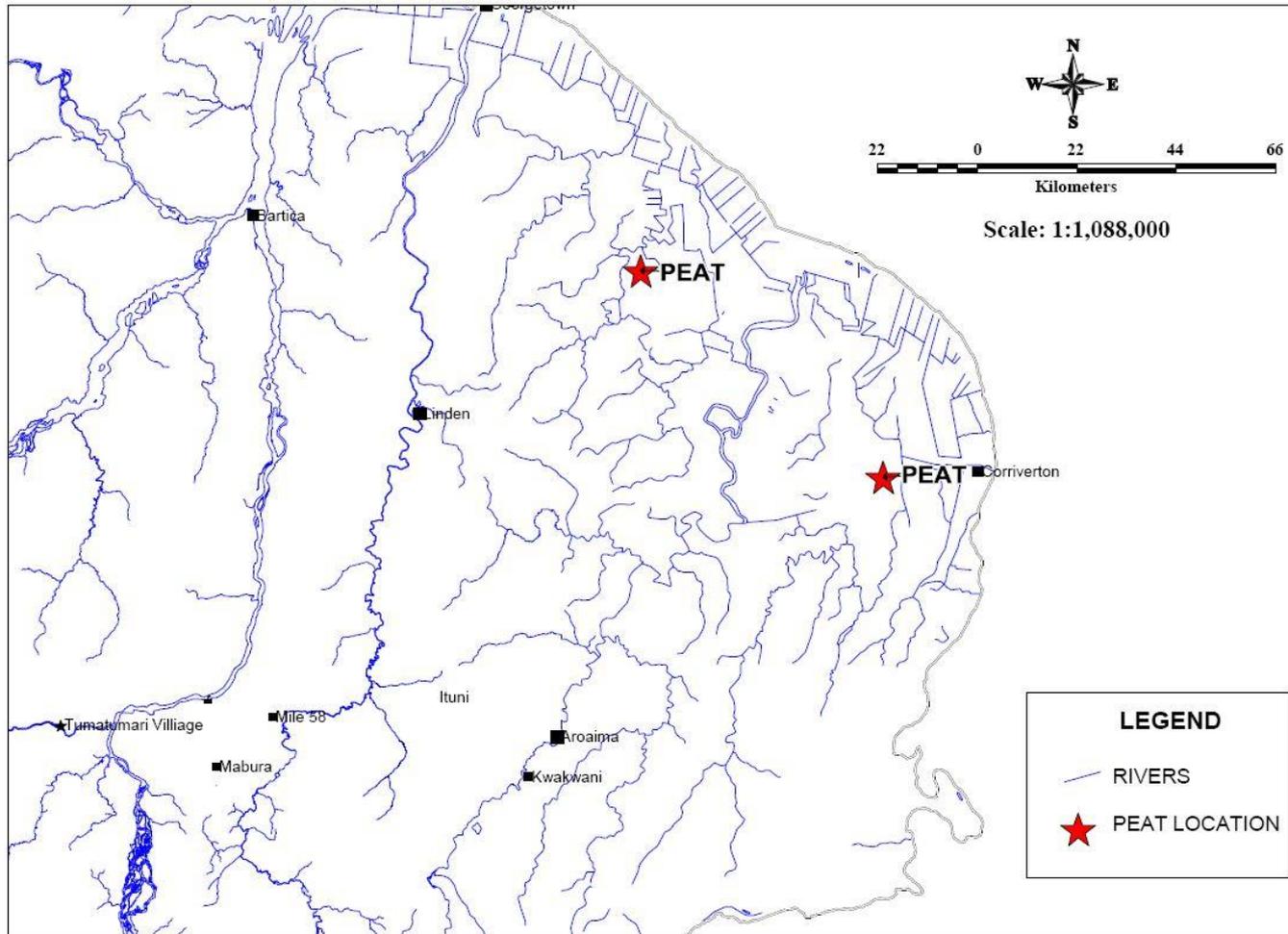
## USES AND FACTS OF PEAT 泥炭土的使用

- ▶ Farmers and gardeners mix peat into soil to improve its structure and to increase acidity.
- ▶ 农民和园艺工人将土壤和泥炭土搅拌在一起，以改善土壤结构并增加土壤酸性
- ▶ It retains moisture in soil when it is dry yet preventing the excess of water from killing roots when it is wet.
- ▶ 在土壤未变干时，泥炭土可帮助保湿，同时，它还可以防止土壤在过湿的情况下，损毁作物的根部。
- ▶ Peat can store nutrients although it is not fertile itself.
- ▶ 泥炭土本身虽不是太肥沃，但它可以储存营养
- ▶ In addition to being soft in texture and therefore suitable for demersal (bottom-dwelling) species such as Corydoras catfish, peat is reported to have a number of other beneficial functions in freshwater aquaria.
- ▶ 除此之外，泥炭土可使物质的材质变软，这一特点适用于底栖性物种，例如鼠鱼。有报导称泥炭土使用于淡水水族箱内，对生活于此的水生动植物也大有裨益。
- ▶ It softens water by acting as an ion exchanger; it also contains substances that are beneficial for plants, and for the reproductive health of fishes.
- ▶ 泥炭土可充当离子交换机器，使水质变软。同时，它还含有一些对植物生长，鱼类生殖有益的物质
- ▶ It can even prevent algae growth and kill microorganisms.
- ▶ 泥炭土甚至可以抑制海藻生长和消灭微生物
- ▶ Peat is used in water filtration, such as for the treatment of septic tank effluent, as well as for urban runoff. Due to its purifying properties, peat also serves as a filter for septic tanks, as well, may be used as a water purifier.
- ▶ 泥炭土可在水过滤，比如化粪池污水处理，城市径流等。由于其具有净化的性能，泥炭土也被用作化粪池的过滤器和水质净化器
- ▶ Many traditional spa treatments include peat as part of peloids. The most common types of peat application in balneotherapy are peat muds, poultices, and suspension baths.
- ▶ 许多水疗护理中也使用泥炭土，作为矿泥的一部分。泥炭土在浴疗中最普遍的几种使用方式就是泥浆法，泥敷剂等。



# PEAT OCCURRENCES IN GUYANA

## 泥炭土在圭亚那的分布图





# SILICA SAND

## 石英砂





# USES AND FACTS OF SILICA SAND

## 石英砂的用途

- ▶ Sands are used in the glassmaking industry. Silica sand is used in the production of container glass, flat plate glass, specialty glass and fiberglass.
- ▶ 沙子用于玻璃制造行业。石英砂可用于生产容器玻璃，平板玻璃，特殊玻璃和玻璃钢等。
- ▶ it is an excellent abrasive material given a hardness of seven on the Mohs' Scale. Silica sands are used for sand blasting, scouring cleansers, grinding media, and grit for sanding and sawing.
- ▶ 由于莫氏硬度可达7级，石英砂是极好的研磨材料。它可用于喷砂除锈，可作去锈剂，研磨体或砂磨和锯割用的砂砾
- ▶ It is used extensively in the construction industry to fill voids and in concrete work.
- ▶ 石英砂被广泛用于建筑行业，用以填补孔洞和混凝土施工中
- ▶ Refractory brick are often made of silica sand because of its high heat resistance. Silica sand is also used as a flux in the smelting of metals.
- ▶ 由于其高耐热的性能，耐火砖经常用石英砂制成。石英砂也被用作助焊剂，以便熔化金属
- ▶ In the petroleum industry sand slurries are forced down oil and gas wells under very high pressures,
- ▶ this high pressure fractures the reservoir rocks and the sandy slurry injects into the fractures holding the fractures open after the pressure is released.
- ▶ 在石油工业中，砂浆在高压下被用力推入油气井内，高压会破坏储油岩，砂浆被注入缝隙中，使得岩石裂缝在压力释放后保持开放状态
- ▶ Silica sand is used as a filler in the manufacture of rubber, paint and putty. Silica sands are used for traction in the railroad and mining industries.
- ▶ 石英砂可作为填充物，用于生产橡胶，涂料和油灰。也可用在铁路、采矿业上，起牵引作用。



# USES OF SILICA SAND

## 石英砂的用途



**GLASS BOTTLES 玻璃瓶**

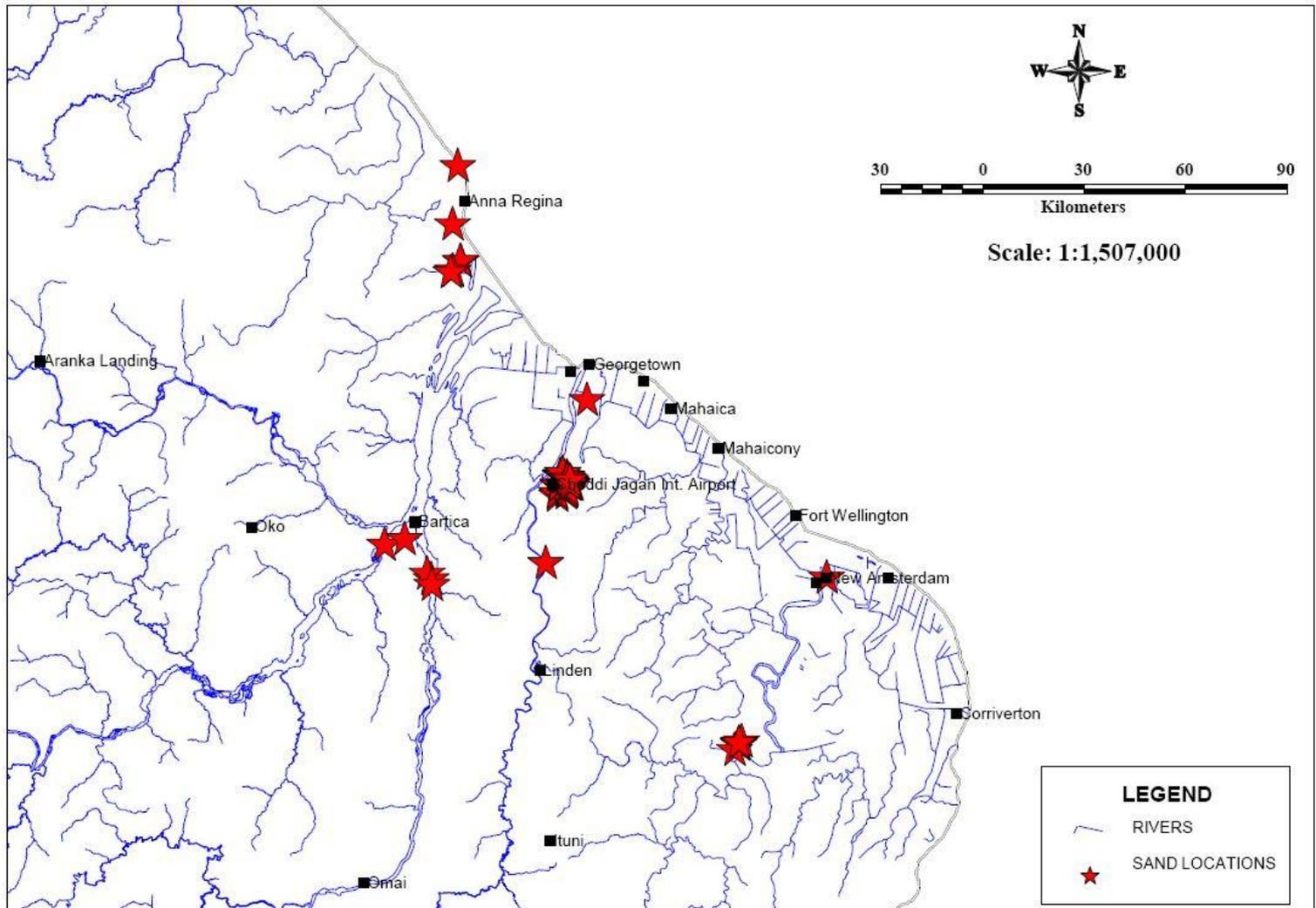


**CONSTRUCTION GLASS  
FOR BUILDINGS 建筑物  
上的建筑玻璃**



# SILICA SAND OCCURRENCES IN GUYANA

## 石英砂在圭亚那的分布图





# Uranium Facts and Formation

## 铀矿的形成

- ▶ The Aricheng South uranium occurrence is associated with Na metasomatism that affected the granitoids of the Kurupung Batholith in western Guyana.
- ▶ 在圭亚那Aricheng南发现的铀矿与地质上交代变质作用有关，它也影响圭亚那西部花岗岩矿的形成
- ▶ A minor amount of uraninite occurs in fractures in the newly formed albite crystals, often in company of calcite.
- ▶ 在新近形成的钠长石水晶的缝隙中发现有少量的铀存在，一般它们与方解石相伴



# Uranium – Uses

## 铀的用途

- ▶ The main use of uranium in the civilian sector is to fuel nuclear power plants
- ▶ 铀在民用领域的使用主要是用作核电站的燃料
- ▶ Uranium are used in small amounts for yellow glass and pottery glaze
- ▶ 铀被少量用于制作黄色玻璃和为陶器上釉彩
- ▶ Use as toner in photography
- ▶ 摄影器材使用的碳粉
- ▶ Use in the leather and wood industries for stains and dyes.
- ▶ 用于皮革和木器制造业中，起染色剂的作用



# Uranium - Uses

## 铀的用途



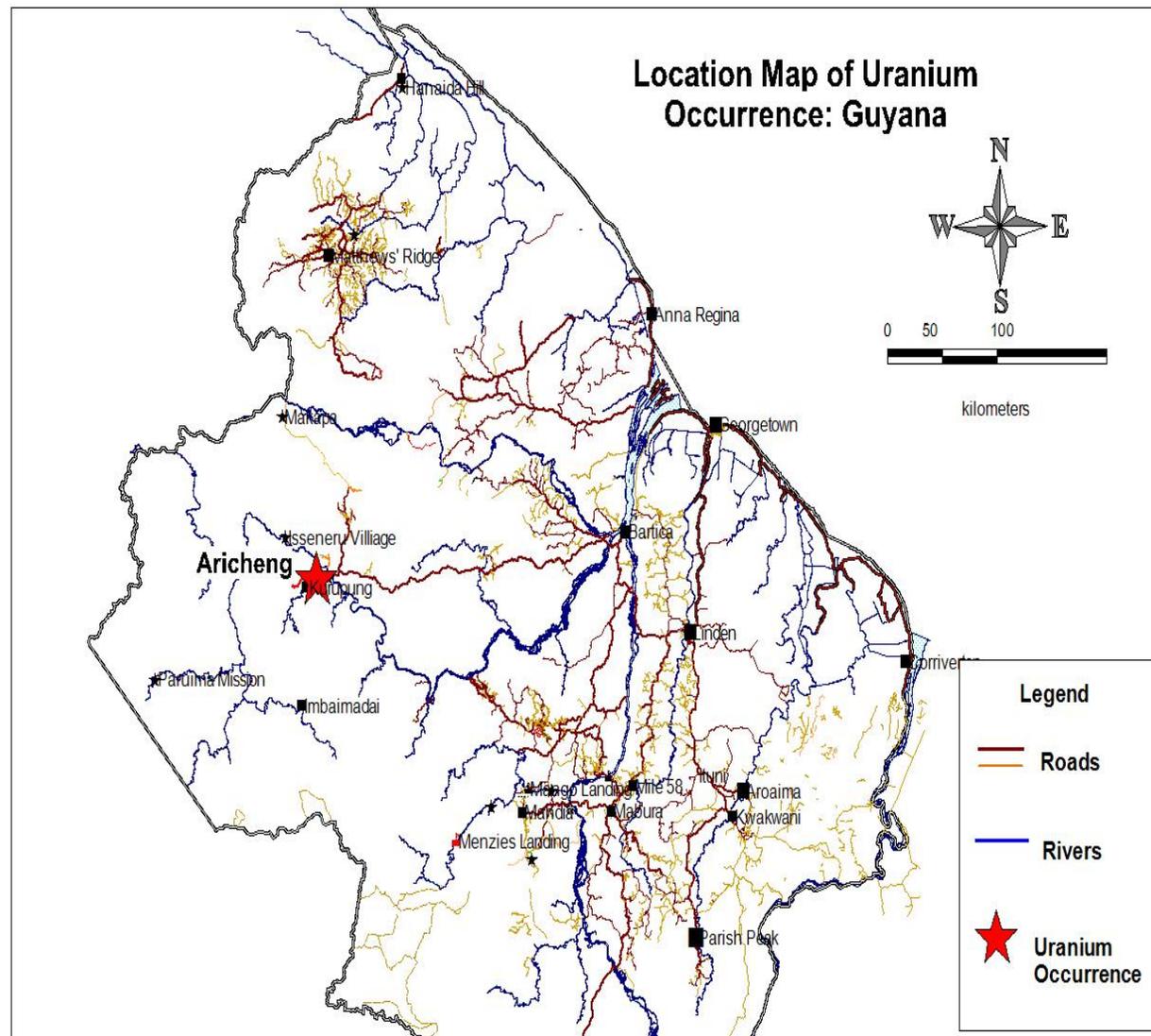
**Nuclear Power Plant**  
**核电站**



**Glow in the Dark**  
**黑暗中发光**

# Uranium Occurrence in Guyana

## 铀矿在圭亚那的分布





# PGMs Facts and Formation

## 铂族金属

- ▶ There is a potential for Platinum Group Metals in two area namely Kaburi and Tappa
  - The Kaburi Anorthosite
  - Tappa Gabbroic Rock
  - (Potarites were found in Potaro River)

在圭亚那Kaburi和Tappa两地有铂族金属存在的可能



# PGMs – Uses

## 铂族金属的用途

- ▶ Three-way catalyst (TWC) compositions employ platinum, palladium, and/or rhodium for the abatement of emissions from petrol/rich-burn engines.
- ▶ 由铂金属，钯金属和铑金属组成的三效催化剂可用于减少油耗巨大引擎的燃气排放
- ▶ Platinum and Palladium are used in the jewelry industry
- ▶ 铂金属和钯金属也可用在珠宝行业
- ▶ PGMs are used extensively in the chemicals sector as catalysts.
- ▶ 铂族金属，作为催化剂，广泛用在化学品行业
- ▶ Also use in electronic, electrical, glass, medicine and automotive
- ▶ 也被用在电子，电力，玻璃制作，制药和汽车业



# PGMs – Uses

## 铂金属的用途



**Three way Catalyst**  
三效催化剂



**Bullions**  
金银条

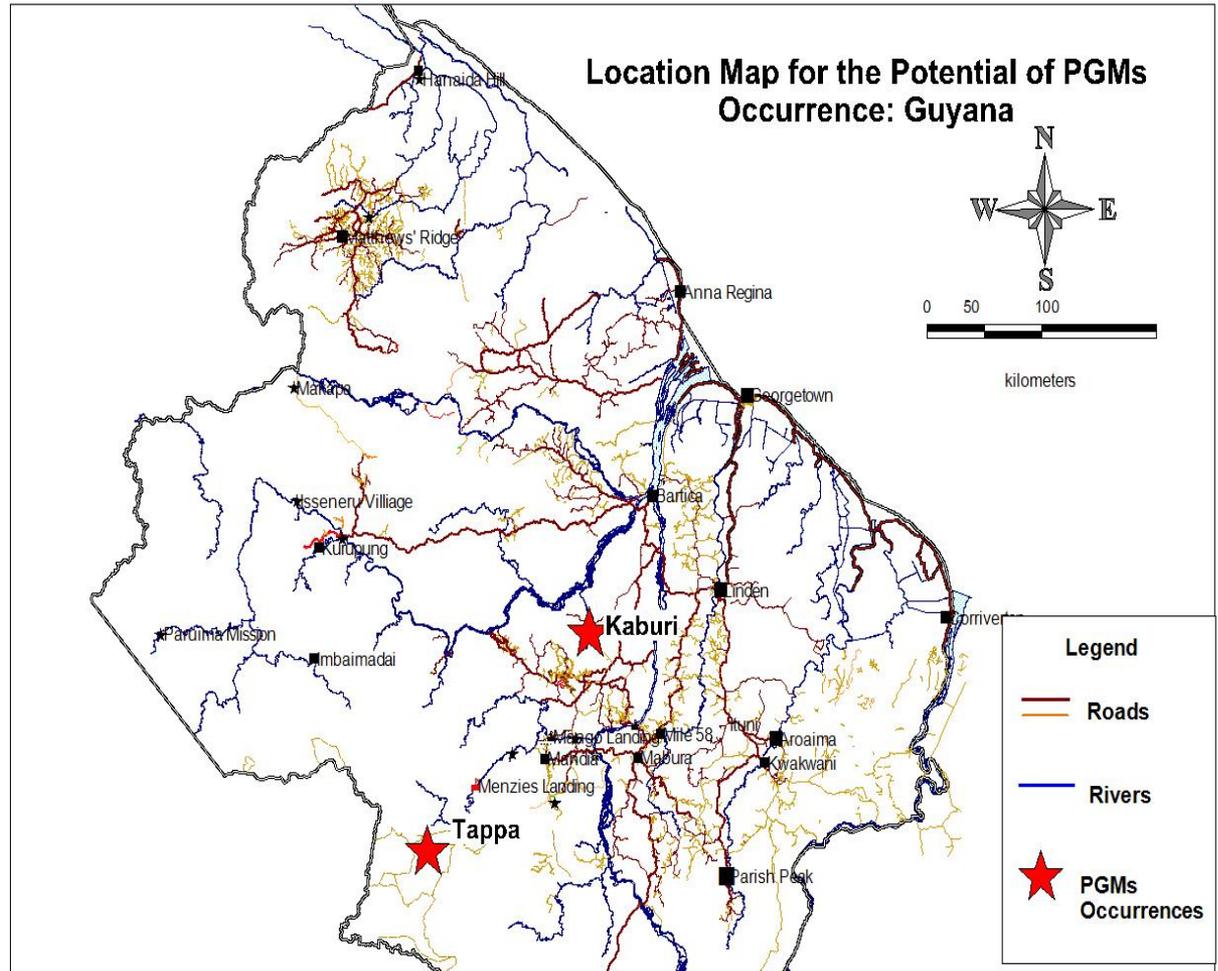


**Application in Electronic and Automotive**  
应用于电子设备和汽车配件中



# PGMs Occurrence in Guyana

## 铂金属在圭亚那的分布





# Phosphate- Uses

## 多磷酸盐的用途

- Use of Polyphosphates for their diverse functionality in water based paints and coatings.
- 多磷酸盐以其功能的多样性，被使用在水性涂料中
- Phosphates Used in the Processing of Various Ceramics.
- 多磷酸盐被用在各种陶器的制作过程中
- Phosphoric acid-based chemical polishes are used primarily to chemically polish (brighten) aluminum and aluminum alloys.
- 以磷酸为原料的化学抛光剂主要用于抛光铝材和铝合金。
- Many phosphorus-containing materials are used as flame-retardants for textiles, plastics, coatings, paper, sealants and mastics.
- 许多含磷材料可用作阻燃剂，使用在纺织，塑料，涂料，造纸，密封胶，胶黏剂的生产中
- "Phosphates and phosphoric acid have many uses in the treatment of potable (drinking) water.
- 磷酸盐和磷酸多用于便携饮料/水的处理上
- Cleaning solutions with phosphates help clean mildew and stubborn stains on vinyl siding.
- 含有磷酸的洗涤液可帮助清除霉菌和残留在乙烯树脂壁板上的顽渍。



# Phosphate - Uses 多磷酸盐的用途



Malaria Tablets 治疟  
疾药片



Fire Extinguishers  
灭火器

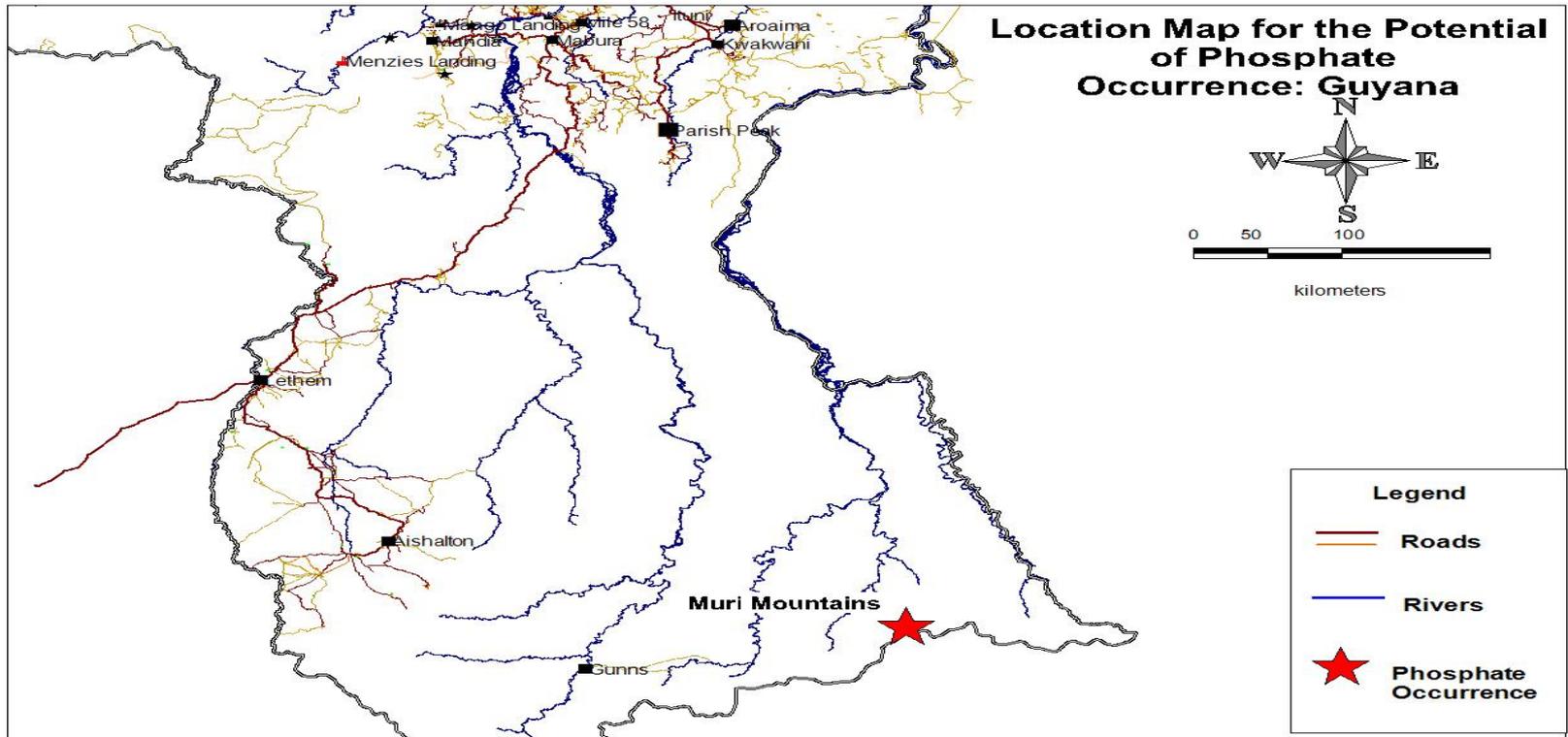


Dishwasher  
洗涤液



# Phosphate Occurrence in Guyana

## 多磷酸盐在圭亚那的分布





# CONCLUSIONS

## 结论

- ▶ Guyana has a long history of mining
- ▶ 圭亚那具有较长的采矿历史
- ▶ Right geological environment for discovering large new deposits
- ▶ 良好的地质环境为发现新的大型矿床提供了可能
- ▶ Has the potential for other minerals largely unexplored by modern methods
- ▶ 圭亚那具有使用现代化方式大规模开采其他矿产的潜质
- ▶ Security of Title and Property Rights with 100% Foreign Ownership of PL's & ML's
- ▶ 百分百外资持有土地所有权和财产权
- ▶ Rights to assign and transfer ownership of PL's and ML's
- ▶ 享有分派和转让所有权的权利
- ▶ Digital Geological and Cartographic data easily available for most mining areas
- ▶ 在多数矿区， 可获取数字化地质和制图数据
- ▶ Stability of agreement with mining companies
- ▶ 与矿业公司所签协议稳妥且有保障
- ▶ Pro-mining Government
- ▶ 扶持采矿业的政府
- ▶ Straight forward procedures for Application and licensing
- ▶ 申请和授权勘探开矿的程序简洁明了
- ▶ Mineral tenures are available to ALL Guyanese
- ▶ 所有圭亚那人都具有矿产使用权



THANK YOU

谢谢!