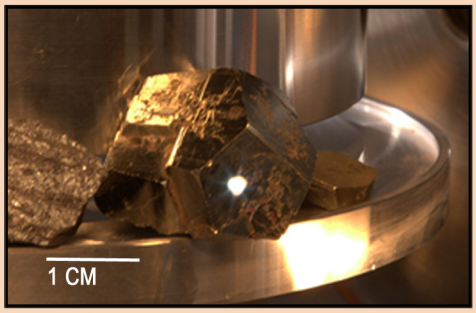
NASAfacts

ChemCam (Chemistry and Camera) Instrument

ChemCam is a rapid chemical and microscopic reconnaissance instrument onboard NASA's Curiosity rover. ChemCam tells scientists what the rocks and soils are made of in the region surrounding the Curiosity rover's landing site. ChemCam, short for chemistry and camera, uses a technique called Laser-Induced Breakdown Spectroscopy (LIBS) to determine the compositions of rocks and soils. The Remote Micro Imager (RMI) gives ChemCam scientists high-resolution images of the rocks and soils that LIBS targets.

LIBS Analysis

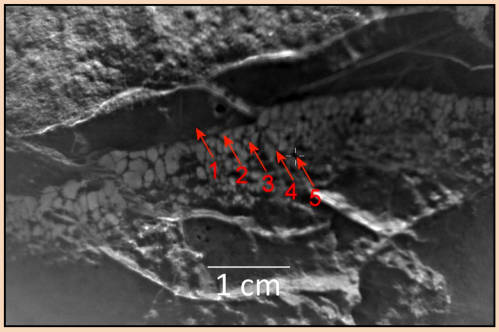
- Pulsed laser vaporizes target rocks and soils up to 7 meters (23 ft) away.
- The spectrum of light from the laser-induced plasma reveals the chemical composition of the target in seconds.
- ChemCam can detect most elements, including the building blocks of life (C, H, N, O).



LIBS spark on a piece of iron pyrite. [1]

Remote Microscopy

- Provides images of target sites before and after laser analysis.
- Highest resolution remote imager on Mars.
- Can see a human hair 2 meters (7 ft) away.



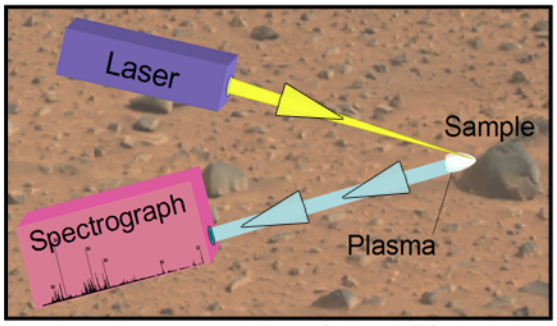
RMI image of calcium sulfate layer 'Selwyn' in Yellowknife Bay on Mars, taken sol 157 from 3.2 meters (10 ft) away. Arrows pinpoint locations of LIBS analyses. [2]

How does ChemCam work?

1. ChemCam fires a series of powerful, but invisible, nanosecond laser pulses at the target rock or soil. (The yellow color of the laser to the right is for illustrative purposes.)

2. Surface material is strongly heated by the laser light causing the material's atoms to emit ultraviolet, visible, and infrared light.

3. ChemCam collects this light (pale blue) with a telescope and sends it down an optical fiber to a spectrometer in the body of the rover. The spectrometer acts like a prism, separating the light into a rainbow of colors. ChemCam distinguishes different elements because each chemical element has its own unique "fingerprint" in the form of characteristic emission lines.



A schematic representation of the LIBS technique ChemCam uses to determine the composition of rocks and soil on Mars. [1]

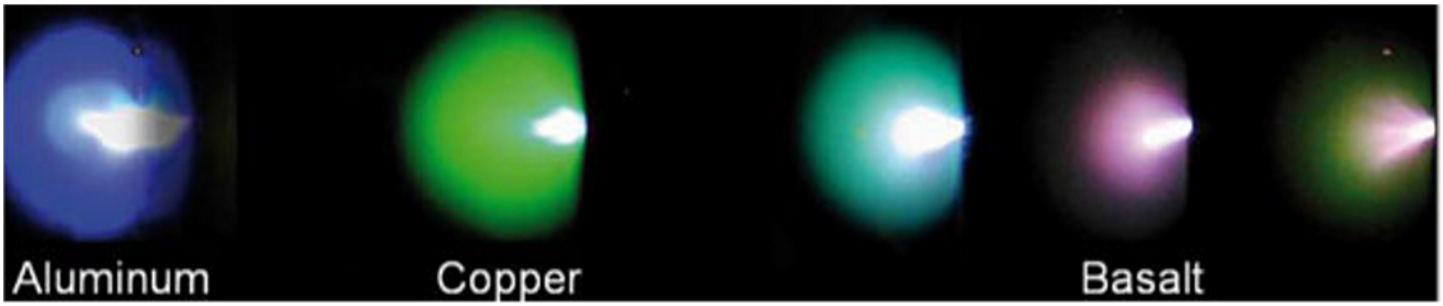
How does ChemCam fit into Curiosity's mission?

ChemCam addresses Curiosity's mission objectives relating to the habitability of Mars:

1. Characterize the geology and geochemistry of the landing site.
2. Investigate planetary processes relevant to past habitability.
3. Assess the biological potential of a target environment.
4. Look for materials that are hazardous to humans.

As a remote sensing instrument, ChemCam's primary objective is to rapidly characterize rocks and soils, and to identify samples of greatest interest for further investigation by contact and analytical laboratory instruments onboard the Curiosity rover.

ChemCam's laser can clear away dust from the surface of its target and can drill through layers of alteration to analyze the pristine interior.



Different elements, such as aluminum and copper, and rock types like basalt give off characteristic colors of light when zapped by the ChemCam laser. [3]

The ChemCam instument is an international collaboration led by Los Alamos National Laboratory in the United States and the Institut de Recherche en Astrophysique et Planetologie in France.

For more information on ChemCam, including interviews with instrument scientists and engineers, please visit the ChemCam website at www.msl-chemcam.com.

Image Credits:
[1] The ChemCam Team and Los Alamos National Laboratory
[2] NASA/JPL-Caltech/LANL/CNES/IRAP/IAS/LPGN
[3] Sirven et al., JAAS, December 2007, Cover