The Terraforming of Venus

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Abstract:The Teraforming of Venus is the hypothetical process of engineering the global environment of the planet Venus in such way as to make it suitable for human habitation. Adjustments to the existing environment of Venus to support human life would require at least 3 major changes to the planet's atmosphere. As we know due to global warming on the earth we are facing various problems and it is difficult to survive. Hence it necessary to find alternative option for living in our nearest planets of our solar system.

Key Words : Terraforming Venus,Environment

The **terraforming of Venus** is the hypothetical process of engineering the global environment of the planet Venus in such a way as to make it suitable for human habitation. Adjustments to the existing environment of Venus to support human life would require at least three major changes to the planet's atmosphere first is lowering, surface temperature, second lowering concentration of carbon dioxide and sulphuric acid gases and third increases concentration of oxygen gas. Anciently it has been observed that Venus is same as that of our Earth that is habitable.as we know carbon dioxide is responsible for greenhouse effect. Hence as concentration of CO2 gas increased and due to that surface temperature also increased. And finally planet becomes non habitable.

On earth carbon is exist in the carbonate form as we learnt from carbon cycle but totally opposite carbon cycle occur on Venus. Hence we have convert carbon into carbonate as mineral formation.as we know lime [CaO] is quite unstable in atmosphere and it has strong affinity towards carbon dioxide. Hence CaO react with atmospheric CO2 vigorously and form carbonate mineral.in order to boost above reaction PS used as catalyst for the same.as we drop Cao off world side by sending Venus probe and it convert carbon into mineral carbonate.

VENUS:

It's a cloud-swaddled planet named for a love goddess, often called Earth's twin. Venus is the second planet from the Sun and is Earth's closest planetary neighbor. It's one of the four inner, terrestrial (or rocky) planets. The atmosphere of Venus is so thick that, from the surface, the Sun is just a smear of light. It's the brightest natural object in the Earth's sky after the Moon. It's the hottest planet in our solar system, even though Mercury is closer to the Sun. Surface temperatures on Venus are about 900 degrees Fahrenheit (475 degrees Celsius) – hot enough to melt lead. The surface is a rusty color and it's peppered with intensely crunched mountains and thousands of large volcanoes. Venus has crushing air pressure at its surface – more than 90 times that of Earth – similar to the pressure you'd encounter a mile below the ocean on Earth.Venus orbits the sun every 224.7 Earth days. It has a synodic day length of 117 Earth days and a sidereal rotation period of 243 Earth days. As a consequence, it takes longer to rotate about its axis than any other planet in the Solar System, and does so in the opposite direction to all but Uranus. This means the Sun rises in the west and sets in the east. Venus does not have any moons, a distinction it shares only with Mercury among the planets in the Solar System.

CHEMICAL ATMOSPHERE:

Venus's atmosphere is one of extremes. Venus has a thick, toxic atmosphere filled with carbon dioxide and it's perpetually shrouded in thick, yellowish clouds of sulfuric acid that trap heat, causing a runaway greenhouse effect. The atmosphere of Venus is composed of 96.5% carbon dioxide, 3.5% nitrogen, and traces of other gases, most notably sulfur dioxide. The amount of nitrogen in the atmosphere is

relatively small compared to the amount of carbon dioxide, but because the atmosphere is so much thicker than that on Earth, its total nitrogen content is roughly four times higher than Earth's, even though on Earth nitrogen makes up about 78% of the atmosphere.

The atmosphere contains a range of compounds in small quantities, including some based on hydrogen, such as hydrogen chloride (HCL) and hydrogen fluoride (HF). There is carbon monoxide, water vapor and atomic oxygen as well. Hydrogen is in relatively short supply in the Venusian atmosphere. A large amount of the planet's hydrogen is theorized to have been lost to space, with the remainder being mostly bound up in sulfuric acid (H_2SO_4). The loss of significant amounts of hydrogen is proven by a very high D–H ratio measured in the Venusian atmosphere. The ratio is about 0.015–0.025, which is 100–150 times higher than the terrestrial value of 1.6×10^{-4}. According to some measurements, in the upper atmosphere of Venus D/H ratio is 1.5 higher than in the bulk atmosphere.

Magnetosphere:

Even though Venus is similar in size to Earth and has a similar-sized iron core, the planet does not have its own internally generated magnetic field. Instead, Venus has what is known as an induced magnetic field. This weak magnetic field is created by the interaction of the Sun's magnetic field and the planet's outer atmosphere. Ultraviolet light from the Sun excites gases in Venus' outermost atmosphere; these electrically excited gases are called ions, and thus this region is called the ionosphere (Earth has an ionosphere as well). The solar wind – a million-mile-per-hour gale of electrically charged particles streaming continuously from the Sun – carries with it the Sun's magnetic field. When the Sun's magnetic field interacts with the electrically excited ionosphere of Venus, it creates or induces, a magnetic field there. This induced magnetic field envelops the planet and is shaped like an extended teardrop, or the tail of a comet, as the solar wind blows past Venus and outward into the solar system.0

History of Venus:

The ancient Romans could easily see seven bright objects in the sky: the Sun, the Moon, and the five brightest planets (Mercury, Venus, Mars, Jupiter, and Saturn). They named the objects after their most important gods. Venus, the third brightest object after the Sun and Moon, was named after the Roman goddess of love and beauty and is the only planet named after a female. Venus may have been named after the most beautiful deity of the pantheon because it shone the brightest among the five planets known to ancient astronomers. Venus was the first planet to be explored by a spacecraft-NASA's Mariner 2successfully flew by and scanned the cloud-covered world on Dec. 14, 1962. Since then, numerous spacecraft from the U.S and other agencies have explored Venus, including NASA's Magellan, which mapped the planet's surface with radar. In ancient times, Venus was often thought to be two different stars, the evening star and the morning star-that is, the ones that first appeared at sunset and sunrise. In Latin, they were respectively known as Vesper and Lucifer. In Christian times, Lucifer, or "Light-bringer," became known as the name of Satan before his fall. However, further observations of Venus in the space age show a very hellish environment. This makes Venus a very difficult planet to observe from cup close, because spacecraft do not survive long on its surface.

Size and distance:

Our nearness to Venus is a matter of perspective. The planet is as big round as Earth-7,521 miles(12,104 kilometers) across, versus 7,926 miles (12,756 kilometers) for Earth. From Earth, Venus is the brightest object in the night sky after our own Moon. The ancients, therefore, gave it great importance in their cultures, even thinking it was tw objects; a morning star and an evening star.

Because Venus' orbit is closer to the sun than ours, the two of them-from our viewpoint-never stay far from each other. The ancient Egyptians and Greeks saw Venus in two guises: first in the orbital position (seen in the morning), then another (your "evening" Venus), just at different times of the year. At its'nearest to Earth, Venus is some 38 million miles (about 61 million kilometers) distant.

CORE:

Venus is a tricky place to study because it's shrouded in a thick atmosphere that hides its surface. And if you can't even see its surface, imagine how difficult it must be to study the interior of Venus. But scientists have been making steady progress towards understanding the interior of the planet, and learn about the core of Venus.

Here on Earth, scientists study the core of the planet by measuring how seismic waves move through the planet after earthquakes. As they pass through the different layers of the Earth's interior; the core, the mantle, and the crust, the waves reflect or bend depending on the change of density that they're passing through. Well, the surface of Venus is hot enough to melt lead, and spacecraft are destroyed within a few hours of reaching the surface of Venus, so no readings have been gathered about Venus' core directly.

Instead, scientists assume that the core of Venus exists based on calculations of its density. The density of Venus is only a little less than the density of Earth. This means that Venus probably has a core of metal about 3,000 km across, surrounded by a 3,000 km thick mantle and a 50 km thick crust.

Scientists aren't sure if the core of Venus is solid or liquid, but they have a few hints. That's because Venus doesn't have a planet wide magnetic field like the Earth. It's believed that the Earth's magnetic field is generated by the convection of liquid in the Earth's core. Since Venus doesn't have a planetary magnetic field, it's possible that Venus' core is made of solid metal, or maybe there isn't enough of a temperature gradient between the inner and outer core to made this convection happen.

It's believed that a global resurfacing even that occurred about 300-500 million years ago might have something to do with this. The entire surface of Venus was resurfaced, shutting down plate tectonics. This might have led to a reduced heat flux through the crust, trapping the heat inside the planet. Without the big heat difference, there's little heat convection, and so no magnetic field coming from the core of Venus.

COMPARING EARTH AND VENUS:

	Earth	**Venus**
GRAVITY	1	0.91
DAY LENGTH	24h	117 days
YEAR	365 days	225 days
AXIS TILT	23°12′	2°36′
AVE.SUNLIGHT	345 W/m^2	655 W/m^2
AVE.TEMPERATURE	+15°C	+460°C
TEMPERATURE RANGE	−60°C to +50°C	−460°C to +460°C
PRESSURE	1 atm (101.3 kPa)	95 atm
ATMOSPHERE	N_2, O_2	CO_2

TERRAFORMING VENUS:

Terraforming is the process of altering a planet to make it more suitable for life(habitable). Usually this means making the planet suitable for most, if not all, Earth life. However if there is dormant or hidden life on the planet, terraforming will change conditions so that this life can possibly flourish. In terraforming, there are intermediate stages where the planet has become habitable, but only to organisms that can survive in extreme environments. The concepts of terraforming developed from both science fiction and actual science. Carl Sagan, an astronomer, proposed the planetary engineering of Venus in 1961.

The surface temperature of Venus is 460Degree. Heat is due to the most effective greenhouse effect in the solar system. Co2 is great at trapping heat-even a rise from 0.03%-0.04% in Earth's atmosphere is heating up our planet right now. Venus's atmosphere

is 97% Co2. At Venus's atmosphere is 93 times denser than Earth's. First and foremost, Venus is almost as big as Earth and has got 90% of its surface gravity. Venus's size means it could be the second largest habitat in the solar system. Perfectly terraformed Venus may be the pleasant place to live outside of Earth.

Referances:

1. *Adelman, Saul (1982). "Can Venus Be Transformed into an Earth-Like Planet?". Journal of the British Interplanetary Society. 35: 3–8.* Bibcode*:*1982JBIS...35....3A.
2. ^ Jump up to:a b c d *Fogg, Martyn J. (1995). Terraforming: Engineering Planetary Environments. SAE International, Warrendale, PA.* ISBN 978-1-56091-609-3.
3. ^ Jump up to:a b c d e *Landis, Geoffrey (2011).* "Terraforming Venus: A Challenging Project for Future Colonization" (PDF). *AIAA SPACE 2011 Conference & Exposition.* doi*:*10.2514/6.2011-7215. ISBN 978-1-60086-953-2. Paper AIAA-2011-7215, AIAA Space 2011 Conference & Exposition, Long Beach CA, Sept. 26–29, 2011.
4. ^ Jump up to:a b c *Sagan, Carl (1961). "The Planet Venus". Science. 133 (3456): 849–58.* Bibcode*:*1961Sci...133..849S. doi*:*10.1126/science.133.3456.849. PMID 17789744.