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Editorial

Heat Energy Properties of Terraforming Microorganisms

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Terra Forming Micro-Organisms and Venus

Snowball Earth was Earth's 2nd birth. For a total of the original birth and 2 rebirths, to a livable climate for microbes, flora and fauna. But what if snowball Earth was normal for a small planet at the same distance to a star as Earth is to our sun? A small planet like Mars, unable to maintain an atmosphere against solar winds. Earth sized Venus, with an atmosphere hot enough to evaporate its own water oceans. And for arguments sake, an almost forever frozen snow ball Earth. Is this the common condition for planets in the majority of other solar systems?

Also apparently common in other solar systems from early astronomy are gas giants and their outer moons.

It has previously been speculated by others, including scientists, that microorganism offer a path to terraforming other planets.

Outer solar system planets

From recent scientific findings and literature (other people's hard won results from their research), I propose a lichen [17] genetically modified as a microbe for terra forming outer solar system planets. With the moss symbiont modified to fluoresce the green light of bioluminescent fungus/moss (that already fluoresce green light) [18,19]. Combined with both a purple Sulphur bacteria (heat generation) [20,21] and a cyanobacteria for photosynthesis sugars and oxygen products [7]. Or genetically engineering the combining of the purple Sulphur bacteria [20,21] and cyanobacteria [14,15] as a single bacteria symbiont for the co-symbiont moss of that Lichen [17]. I believe I may have been the first to suggest this combination microbe, but acknowledge all the previous and current research work by others that made this suggestion possible. Thus I forfeited all patent rights on such a microbe and declared such a patent as an open patent on such a microbe.

Such a microbe would be able to generate its own light (fluoresce the green light of bioluminescent fungus/moss symbiont) [18,19] cyanobacteria that already accepts green wavelength light photons [15,16] to photosynthesis its own sugars and create its own oxygen for its own respiration. While 2nd symbiont purple Sulphur bacteria [20,21] metabolizes sulphur to generate energy for both its metabolism and creating excess heat, into its micro-environment. It was hoped that such a microbe would add heat to its micro-environment in a cocoon of rock and ice; warming the frozen greenhouse gases of outer solar system planets (snowball Earths?) [24] to cause those gases to melt and become a gaseous atmospheres.

Venus, an inner solar system planet hottey

But what about hot inner solar system planets like Venus? Could Venus like planets form the majority of planets in our Milky Way galaxy? While the Earth like planets are as rare as hen's teeth? Then what? Venus has a volume of inert di-nitrogen gas 4x greater than the Earth's di-nitrogen inert atmosphere [1,2,4].

As a percentage, di-nitrogen occupies only 3% total Venetian atmospheric volume$_5$. So where is the inert di-nitrogen gas 4x greater than the Earth's di-nitrogen inert atmosphere? It's hidden to the thoughts of humankind under the reality, yet the illusion, of the tremendous Venutian atmospheric pressure [1,2,4]. By releasing that Venutian atmospheric pressure valve, will the inert di-nitrogen gas become available for plant and animal life to breathe? But doesn't animal and plant life need oxygen with the inert di-nitrogen gas, to sustain their lives, just like on Earth? [6].

The Venutian atmospheric pressure valve is also the 'locked up' and 'locked away', source of oxygen. The greenhouse gas culprit is carbon dioxide [1,2,3,8].

Many others have suggested microbes could be a way of terraforming planets to more Earth like conditions. Or that microbes may already exist on Venus! Revisiting this idea of others, that microbes could be a way of terraforming planets, what steps could be taken specifically for terraforming Venus with microbes? That may not have already been covered. Plants break the carbon dioxide molecule into oxygen and sugars. Sugars containing carbon, hydrogen and oxygen. Thus water (H_2O) plus water plus carbon dioxide (CO_2) are converted by plants into oxygen O_2 and sugar ($C_6H_{12}O_6$) [7].

Hydrogen is sparsely available in the Venus atmosphere as sulphuric acid (H_2SO_4) [1,2]. Such that the majority of Earth plants or Earth microbes would need this hydrogen to be released from sulphuric acid first and converted to water, in order to break apart the carbon dioxide molecule into carbon and oxygen [7]. As until the carbon dioxide molecule is broken apart into carbon atoms and oxygen atoms, the Venutian greenhouse gas effect will stop the cooling of the Venus planet [8].

Although the initial gases look available for Earth plants or Earth microbes to cool Venus by removing carbon dioxide from the Venutian atmosphere. The atmospheric temperatures and atmospheric pressures on Venus would destroy any plant, animal, or microorganism [1,2].

Then there is the smaller detail of trace element minerals which we generally take for granted [7]. As all plants and microbes need carbon, which we have on Venus in abundance, hydrogen, which we have on Venus in small quantities, oxygen which we have on Venus, (added all together = sugars/$C_6H_{12}O_6$). Plus nitrogen which is needed for both amino acids (e.g. proteins/enzymes) and deoxyribonucleic acids (D.N.A.), which we have on Venus, but also phosphorous for deoxyribonucleic acids themselves (D.N.A.), which may or may not be on Venus in sufficient quantities! [7].

So, Venus seems to have the minimal elements to sustain life, provided phosphorous and other trace mineral elements are available [7].

Despite the prohibitive temperatures (470°C) [1,2] and pressures [1,2] for life to take a hold on Venus at the surface of the planet, there is an a layer of atmosphere with benign temperatures and pressures which are capable of sustaining life Earth plant and microbial life [1,2]. A layer of atmospheric CO_2 at a height of about 54 km above the Venus surface, with a temperature area of 20°C [1,2]. At about 50 km (30 miles)there is also the layers of sulphuric acid clouds. Meaning that instead of the critical water for microbes to metabolize and multiply in. Turning the carbon dioxide CO_2, into Carbon, C and oxygen gas, O_2. A process similar to photosynthesis will need to be done in the sulphuric acid droplets (H_2SO_4) of Venutian clouds [1,2,7].

So are microbes to be genetically engineered to break apart CO_2 into C and O_2 while surviving in H_2SO_4 acid droplets, in the 50 km height atmospheric zone, of Earth like temperatures and pressures? (25°C and 1 atm Earth sea level air pressure) [1,2].

Or are microbes to be introduced to convert the H_2SO_4 into water to be converted to sugar or cellulose. Destroying the H_2SO_4 cloud cover [1,2]. Will destroying the H_2SO_4 cloud cover of Venus allow enough heat to leave the Venutian atmosphere and result in Venus night time temperatures drop from 450°C to 250°C or even 80°C?

As increasing temperature in a closed system increases the pressure in that system. And increasing pressure in a closed system can cause a corresponding increase in temperature [10]. By the equation $CO_2 \rightarrow C + O_2$ Once microbes break down CO_2 (carbon dioxide molecule) into C (carbon atoms) and O_2 (two oxygen atoms that can quickly form a di-atomic molecule), the number of molecules or atoms will increase [10].The left hand of the equation has one mol of CO_2 (carbon dioxide molecule), while the right hand of the equation has one mol of C (carbon atoms) atoms and another mol of O_2 (di-atomic atoms). One mol on the left and one mol plus another one mol on the right of the equation means two mols on the right. Therefore pressure will initially increase. By the gas formulae PV = nRT, transposed to P = nRT/V [9].

By the gas formula an increase in the number of mol (n) will give a corresponding increase in the pressure (P) of the system, the atmospheric system of Venus [9].

But the whole idea is to decrease the temperature and pressure of the Venus atmosphere! The temperature and pressure of Venus will only decrease when the volume and therefore the effect of the non-greenhouse gases (O_2 and N_2) is greater than the volume and therefore the effect of the greenhouse gases; primarily CO_2 [10].

O_2 and N_2 are covalent molecules that because they are di-atomic of the same element and share their outer valance electrons evenly. By nature of their valance bond geometry O_2 and N_2 gases allow infrared radiation wavelengths of radiation to pass through them; with no absorption of energy [8,11].

Whereas CO_2 molecule has a covalent bond geometry resulting from an uneven sharing of outer shell valance electrons. Where infrared photons or wavelengths of radiation are absorbed by the CO_2 molecule [8,11].

Through the bending, twisting, rotating, of the uneven distribution, of the covalent outer shell electron bonds between the C atom and the two O atoms. Called a dipole moment, where C is more positive and O atom is more negative relative to their uneven sharing of electrons [8,11].

The CO_2 molecule in the atmosphere absorbs infrared radiation passing into Venus and trying to escape Venus. As this infrared radiation is converted to kinetic energy in the flexing of the CO_2 molecule's atoms because of its non-polar covalent bond geometry and uneven sharing of outer shell electrons [8,11].

After the initial rise in pressure and probably an initial rise in temperature by the equation and formula:

$CO_2 \rightarrow C + O_2$ and gas formula P = nRT/V [9].

As the temperatures begin to drop in the Venutian atmosphere, what will be the new average temperatures and pressures at the Venutian surface and through the atmosphere cloud layers [1-4]. And what will happen when non-greenhouse gases like O_2 and N_2, increase [8] as a percentage of the Venutian atmosphere. Which like an open window, would allow Venetian planetary and atmospheric heat to escape into outer space. Would an increase in non greenhouse gases like O_2 and N_2 as [8] a percentage of Venutian atmosphere, result in a greater cooling of Venus and a lower new temperature and pressure equilibrium of the Venus atmosphere [8,9]. Than the single effect of decreasing the CO_2 molecule concentration only?

All microbes need a liquid, or moisture to metabolize and reproduce. Whether an acid H_2SO_4, a polar liquid H_2O, or a non-polar, organic, volatile C_8H_{10} (octane), air humidity, or a viscous oil/fat [7].

The challenge for genetic engineers is to develop a microbe (whether bacteria, arcadia, or diatom, other plant like microbes, like cyanobacteria [12,14,17,22,23,25] that will break apart CO_2 into C and O_2.

Yet the use of disproportionately small amount of H atoms from small concentrations of atmospheric H_2SO_4, for the microbes own sugar manufacturing needs. While disproportionally breaking apart the CO_2 into C and O atoms.

Earth Photosynthesis Microbe $=6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ [7]

Genetically Engineered Microbe= $CO_2 \rightarrow C + O_2$.

Venus Microbe $=9CO_2 + 6H_2SO_4 \rightarrow C_6H_{12}O_6 + 18O_2 + 3CS_2$

All while living in a cloud layer. If the sulphuric acid droplets are dissipated into space, or absorbed into a microbes structure, converted to H_2O, which is scarce and absorbed into a microbes structure. Then the microbe will have to survive, metabolize, reproduce and convert CO_2 into C and O_2; in a dry, Hydrogen depleted environment [1,2,7].

If this genetic engineering feat of microbes can be achieved, then Venus will have an excellent prospect of becoming a planet with a breathable atmosphere of N_2 and O_2 gases for all plant and animal life from Earth. But probably a desert like landscape.

Conclusion

Venus is the closest planet to planet Earth, with an equal size and gravity to Earth's. With O_2 gas locked up as CO_2 and inert N_2 gas suppressed under Venus's greenhouse atmosphere condition.

With a minor miracle of human intervention genetic engineering. The Venutian atmospheric of CO_2 could [1,2], be converted into C and O_2, by genetically engineered microbes. Thus, the end result may be a Venus with an atmosphere of breathable N_2 and O_2, at temperatures under 100°C; and night time temperatures a balmy 50°C or less.

What country wouldn't take up a challenge such as this? From an asteroid collision perspective, it cannot hurt to have 5% of your population off planet.

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