Heat Energy Properties of Terraforming Microorganisms

Leo M Likar\textsuperscript{1,2}\textsuperscript{*}
\textsuperscript{1}Box Hill Institute, Australia
\textsuperscript{2}Swinburne University, Australia

\textsuperscript{*}Corresponding Author: Leo M Likar, Box Hill Institute, Australia.

Received: October 03, 2019; Published: October 18, 2019

Terra Forming Micro-Organisms and Venus

Snowball Earth was Earth's 2\textsuperscript{nd} 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 2\textsuperscript{nd} 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].

Citation: Leo M Likar. "Heat Energy Properties of Terraforming Microorganisms". \textit{EC Clinical and Experimental Anatomy} 2.9 (2019): 01-05.
Heat Energy Properties of Terraforming Microorganisms

As a percentage, di-nitrogen occupies only 3% total Venetian atmospheric volume. 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 (H₂O) plus water plus carbon dioxide (CO₂) are converted by plants into oxygen O₂ and sugar (C₆H₁₂O₆) [7].

Hydrogen is sparsely available in the Venus atmosphere as sulphuric acid (H₂SO₄) [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/C₆H₁₂O₆). 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 CO₂ 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 CO₂, into Carbon, C and oxygen gas, O₂. A process similar to photosynthesis will need to be done in the sulphuric acid droplets (H₂SO₄) of Venutian clouds [1,2,7].

So are microbes to be genetically engineered to break apart CO₂ into C and O₂ while surviving in H₂SO₄ 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 H₂SO₄ into water to be converted to sugar or cellulose. Destroying the H₂SO₄ cloud cover [1,2]. Will destroying the H₂SO₄ 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?
Heat Energy Properties of Terraforming Microorganisms

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 \( \text{CO}_2 \rightarrow \text{C} + \text{O}_2 \). Once microbes break down \( \text{CO}_2 \) (carbon dioxide molecule) into \( \text{C} \) (carbon atoms) and \( \text{O}_2 \) (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 \( \text{CO}_2 \) (carbon dioxide molecule), while the right hand of the equation has one mol of \( \text{C} \) (carbon atoms) atoms and another mol of \( \text{O}_2 \) (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 (\( \text{O}_2 \) and \( \text{N}_2 \)) is greater than the volume and therefore the effect of the greenhouse gases; primarily \( \text{CO}_2 \) [10].

\( \text{O}_2 \) and \( \text{N}_2 \) 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 \( \text{O}_2 \) and \( \text{N}_2 \) gases allow infrared radiation wavelengths of radiation to pass through them; with no absorption of energy [8,11].

Whereas \( \text{CO}_2 \) 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 \( \text{CO}_2 \) molecule [8,11].

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

The \( \text{CO}_2 \) 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 \( \text{CO}_2 \) 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:

\[ \text{CO}_2 \rightarrow \text{C} + \text{O}_2 \] 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 \( \text{O}_2 \) and \( \text{N}_2 \), 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 \( \text{O}_2 \) and \( \text{N}_2 \) 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 \( \text{CO}_2 \) molecule concentration only?

All microbes need a liquid, or moisture to metabolize and reproduce. Whether an acid \( \text{H}_2\text{SO}_4 \), a polar liquid \( \text{H}_2\text{O} \), or a non-polar, organic, volatile \( \text{C}_8\text{H}_{10} \) (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 \( \text{CO}_2 \) into \( \text{C} \) and \( \text{O}_2 \).

Citation: Leo M Likar: “Heat Energy Properties of Terraforming Microorganisms”. *EC Clinical and Experimental Anatomy* 2.9 (2019): 01-05.
Yet the use of disproportionately small amount of H atoms from small concentrations of atmospheric H₂SO₄, for the microbes own sugar manufacturing needs. While disproportionally breaking apart the CO₂ into C and O atoms.

Earth Photosynthesis Microbe =6CO₂ + 6H₂O→C₆H₁₂O₆+6O₂ [7]

Genetically Engineered Microbe = CO₂ → C+ O₂.

Venus Microbe =9CO₂ + 6H₂SO₄→C₆H₁₂O₆+18O₂+ 3CS₂

All while living in a cloud layer. If the sulphuric acid droplets are dissipated into space, or absorbed into a microbes structure, converted to H₂O, which is scarce and absorbed into a microbes structure. Then the microbe will have to survive, metabolize, reproduce and convert CO₂ into C and O₂; 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 N₂ and O₂ 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 O₂ gas locked up as CO₂ and inert N₂ gas suppressed under Venus’s greenhouse atmosphere condition.

With a minor miracle of human intervention genetic engineering. The Venutian atmospheric CO₂ could [1,2], be converted into C and O₂, by genetically engineered microbes. Thus, the end result may be a Venus with an atmosphere of breathable N₂ and O₂ 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.

Bibliography

4. “Clouds and atmosphere of Venus”. Institut de mécanique céleste et de calcul des éphémérides.

Citation: Leo M Likar. “Heat Energy Properties of Terraforming Microorganisms”. EC Clinical and Experimental Anatomy 2.9 (2019): 01-05.
Heat Energy Properties of Terraforming Microorganisms


17. "What is a lichen?". Australian National Botanic Gardens.


20. Purple sulfur bacteria.


22. Diatom.


Volume 2 Issue 9 November 2019
©All rights reserved by Leo M Likar.

Citation: Leo M Likar: “Heat Energy Properties of Terraforming Microorganisms”. EC Clinical and Experimental Anatomy 2.9 (2019): 01-05.