M.A.I.N. Pack

Martian Air Ion Neutralizer Pack

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Introduction

For years scientists have been trying to develop life on Mars, but one of the limiting factors has been the toxic atmosphere. One of the more potent toxins on Mars are perchlorates. These compounds consist of four oxygen atoms bonded to one chlorine atom, with an overall negative charge. Since these toxic compounds, on Mars, are highly abundant and the amount of breathable air is close to none, usable Oxygen can be produced while reducing the amount of toxicity in the atmosphere by using a method similar to perchlorate water filtration.

Method/Overview

The idea behind this filter was to create something portable, like a backpack (figure 2), that would filter out the toxic air and produce oxygen without the worry of running out. The M.A.I.N. Pack would be used with a space suit and hopefully replace the oxygen tank. This backpack was designed to suction air from the top right side, pass the toxic air through the ion exchange filter and push the filtered air into a storage tank with the help of an air compressor (figure 1). The ion exchange filter would work by using positively charged ion exchange resins beads to capture the negatively charged perchlorate ion from the atmosphere ("Technology Information Sheet Ion Exchange" 2004). Since the perchlorate ion is more strongly attracted to the resin then the resin ion, the perchlorates would take the place of the resin ions causing the bonds of the molecule to break and oxygen to be released (Dozier & Melton 2019). Figure 3 shows a basic process of this method. The discarded chlorine ion would then be stored in the waste tube until it could properly be disposed of, according to any environmental rules and regulation there may be ("Technology Information Sheet Ion Exchange" 2004). The free oxygen would then pass into a storage tank where it can then be used. Over a period of time the the resin beads become saturated with the perchlorate ions and will require the resins to be changed out for new ones (Dozier & Melton 2019). This filtration method would hopefully provide more oxygen and reduce the worry of running out.

Hypothesis

By using an ion filtration process in a portable backpack toxic air from the atmosphere on Mars can be filtered and used as an oxygen source.

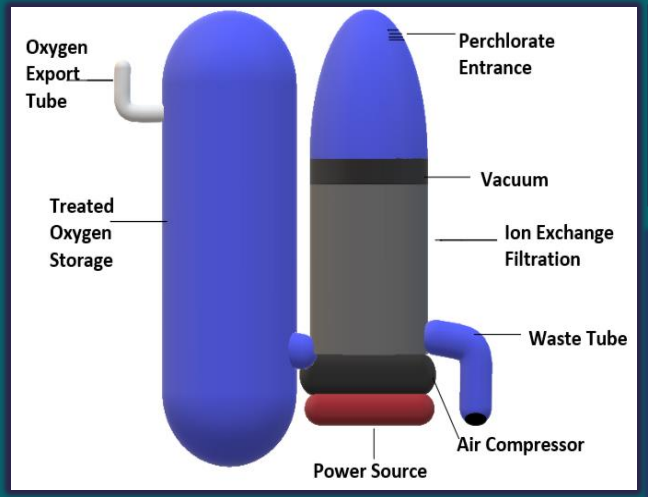

Figure 1. (To the left) Labeled model of the M.A.I.N pack and all the components.

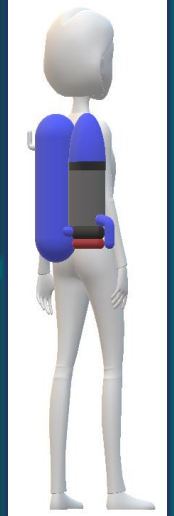

Figure 2. (Above) Scale model of M.A.I.N pack on a person.

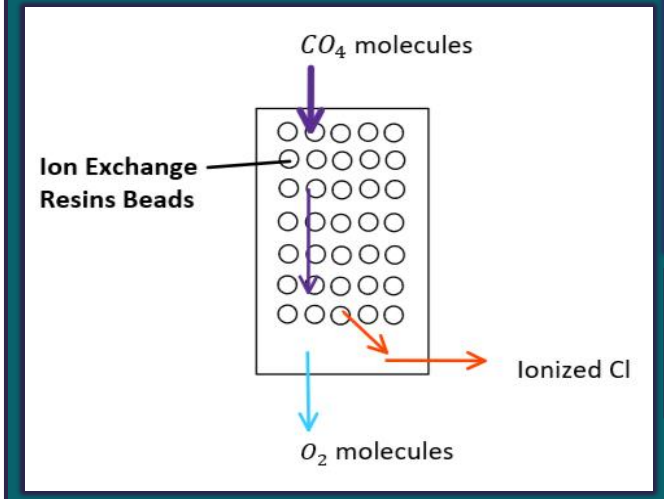

Figure 3. Theoretical process of how the ion exchange filtration would work.

Conclusion

Though life has not been developed on mars as of now, scientist all over the world are working on the possibility of one day colonizing it. One of the first few steps taken to make that happen would be to clear out the toxic atmosphere to have breathable air. This theoretical model of a perchlorate filter would help accomplish that goal. The purpose of the M.A.I.N. Pack is to produce usable oxygen from the toxic atmosphere on mars. This way the air gets filtered out, humans can breathe, and there is less of a worry about running out of oxygen. The backpack is meant to continuously suction the toxic air, filter it, and produce clean oxygen. With the help of the M.A.I.N. Pack, the process of colonizing and living on Mars is made easier and more efficient.

References

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