IOSR Journal of Applied Chemistry (IOSR-JAC)
e-ISSN: 2278-5736. Volume 18, Issue 6 Ser. 1 (June 2025), PP 34-35
www.iosrjournals.org

Identifying Life on Other Planets (A Review Paper)

Nagaparidhi Sridhar

Date of Submission: 03-06-2025 Date of Acceptance: 13-06-2025

The universe is so vast that it's hard to believe Earth is the only place with complex and intelligent life. While the idea of finding life on other planets is exciting, discovering elements and compounds on exoplanets[1] (the planets that orbit stars outside our solar system) can be a tough task. But Humanity is resolutely addressing the barriers by developing and relying on "Astro-chemistry[2]."

Astro-chemistry is the study of molecules that are distributed throughout the universe and how they interact with radiation. This fascinating field explores the presence of various molecules in space and their interactions with different forms of radiation. By understanding these processes, we can deepen our knowledge of cosmic chemistry and gain insights into the formation and evolution of the universe.

Astro-chemistry employs spectroscopy and radio astronomy to identify the elements in the universe, as it is a well-known fact that elements absorb specific wavelengths, known as their characteristic spectra. Radio telescopes can determine the elements present on exoplanets based on these spectra. For instance, water has been detected on a moon of Jupiter called Europa[3] which is located 623

[1] https://en.wikipedia.org/wiki/Exoplanet
[2] https://en.wikipedia.org/wiki/Astrochemistry
3 https://www.google.com/search?q=europa+distance+from+earth+in+light+years&sca_esv=d018551566c532b9&rlz=1C1CHZN_enIN1132IN1132&sxsrf=ADLYWILbQF8ZpR3E2cWHwNLUZXNrUNJthQ%3A1735493367077&ei=94ZxZ8mzBO7s1e8PjIeNkAE&oq=Europa&gs_lp=Egxnd3Mtd2l6LXNlcnAiBkV1cm9wYSoCCAAyChAjGIAEGCcYigUyCxAAGIAEGJECGIoFMgoQABiABBhDGIoFMggQLhiABBixAzINEAAYgAQYsQMYQxiKBTIIEAAYgAQYsQMyBRAA

million km away from Earth. However, the accuracy of radio telescopes is generally lower than that of infrared telescopes, due to the longer wavelengths of radio waves. Constructing larger telescopes is necessary to achieve higher resolution.

Another type of telescope used in astronomy is the infrared telescope. The spectra of organic compounds and certain molecules, such as carbon dioxide (CO2), fall within the infrared range. Thus, infrared telescopes provide higher resolution and greater accuracy in identifying the elements that make up these compounds.

For example, a compound called dimethyl sulfide was discovered on K2-18b[4], a planet located 124 light-years (approximately 1.173×10^{15} km) from Earth. This compound is produced by marine bacteria and phytoplankton, offering significant insights into the possibility of life on another planet. Through infrared astronomy, we discovered polycyclic aromatic hydrocarbons that are found abundantly in coal, crude oil, gasoline, and other carbon-rich solids.

While IR spectroscopy makes it easier to detect most elements, nitrogen gas, often called invisible gas, is quite difficult to identify through IR. Hence, it is detected through the spectra created when two Nitrogen molecules collide.

In conclusion, Astro-chemistry not only enhances our understanding of the chemical processes that could support life beyond Earth, but it also fuels the ongoing exploration of the cosmos, inspiring us to seek answers about our place in the universe and to inspire us to believe that we may not be alone in this incredible Universe.

GIAEMggQABiABBixAzIIEAAYgAQYsQMyCBAuGIAEGLEDSMwQUABYAHAAeACQAQCYAaoBoAGqAaoBAzAuMbg
BAcgBAPgBAvgBAZgCAaACsgGYAwCSBwMwLjGgB9AL&sclient=gws-wiz-serp

[4] https://en.wikipedia.org/wiki/K2-18b#:~:text=K2%2D18b%2C%20also%20known%20as,within%20the%20star's%20habitable%20zone.