ABIOTIC SYNTHESIS OF PH_3 ON PLANET VENUS

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The mane of PH_3 is: phosphine (IUPAC name: phosphane)

The discovery of traces of PH_3 in the atmosphere of Venus was announced on September 14th 2020 [1], and this was considered as a sign of life, because extraterrestrial life experts definethe presence of traces of PH_3, as one of the criteria for life existence on a planet. This is due to the fact that this compound can be produced in traces from the bacterial decomposition of DNA and RNA, because H and P are 2 out of the 5 chemical elements of these chemical structures.

However, the chemical compounds and conditions for the abiotic production of traces of PH_3 exist in Venus. Specifically: traces of PH_3 can emerge from the phosphides of the metals that are present in the soil of Venus, or a bit underneath it, under the effect of the sulfuric acid derived from its atmosphere [8].

Metal phosphides are present in the igneous rocks of planets and satellites [6-7], such as in thefollowing reported cases:

Among the constituents of magma on Earth there are small amounts of metal phosphides. Igneous rocks can result from magma coagulation.

Phosphides of the metals Ni, Co, V and Mohave been found in ophiolite rocks on Mount Dirfis in Evia, Greece [4]. Moreover, ironphosphides (FeP) and nickelphosphides have been also foundin ophiolites in BakanovKluch, Alapaesk, Russia and in the mines of Gerakini and Olympiada in Greece [5].Ophiolite is a rock that is formed in the mid-ocean ridges, where a deviation of lithospheric plates takes placeas the result of the solidification of magma that comes in contact with water.

Iron and nickel phosphides have been found in basaltic rocks in Western Australia. Basalt is a rock that results from the rapid solidification of lava when it flows on the surface of a planet or satellite [6].

Moreover, iron and nickel phosphides have been also found in meteorites [6-9-10], on Moon [9-10], as well as on Mars [7].

Igneous rocks are also present on Venus [3].

Phosphine is obtained from phosphidesunder the effectof acids.

$FeP + 3H^+ \rightarrow Fe^{3+} + PH_3$

PH_3 production can also occur, however at a slower rate, from the effect of water on FeP .

Moreover, the temperature conditions existing on the surface of Venus favor the formation of phosphides of active metals, such as AlP and Mg_3P_2, which can react with traces of water vapor or sulfuric acid in its atmosphere [9] and give traces of PH_3.

$AlP + 3H_2O \rightarrow Al(OH)_3 + PH_3$ *(effect of water vapor).*

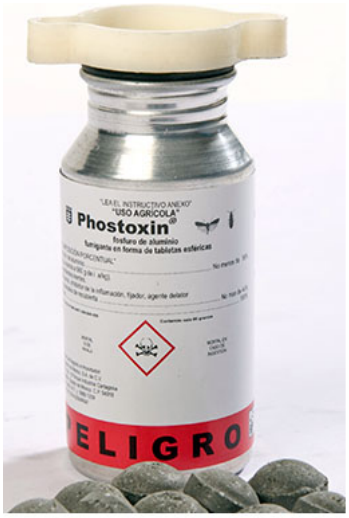
$AlP + 3H^+ \rightarrow Al^{3+} + PH_3$ *(effect of sulfuric acid)*

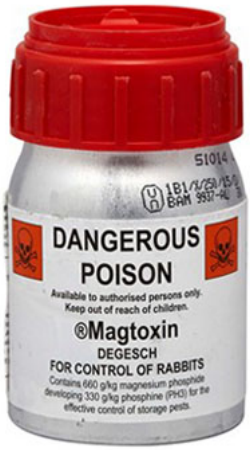
$Mg_3P_2 + 6H_2O \rightarrow 3Mg(OH)_2 + 2PH_3$ *(effect of water vapor)*

$Ca_3P_2 + 6H^+ \rightarrow 3Mg^{2+} + 2PH_3$ *(effect of sulfuric acid)*

I would like to note that the compounds AlP and Mg_3P_2 are used in the form of tablets for disinfestation and rodenticides in warehouses for seed storage under various brand names, such as Phostoxin, Magtoxin.

When tablets of these formulations are left in a warehouse, phosphine is produced,under the effectof minimal water vapor in the atmosphere, as shown by the aforementioned chemical equations. Phosphine is ableto kill insects and mice,and humans as well,if we are not careful.





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