What is the Polyatomic Liquid Oxygen (PLO – RONS)?

The Polyatomic Liquid Oxygen is a radical aqueous mixture, saturated with reactive oxygen species (ROS) and reactive nitrogen species (RNS).

In the laboratories of the National Research Council of Italy, C.N.R., Institute of Chemistry of Organo Metallic Compounds-ICCOM, in Pisa, have been defined the components ROS and RNS, which are the solutes in the radical oxidative mixture of the Liquid Oxygen Polyatomic (OPL-RONS).

The device “Sputering inverso” to produce the mixture OPL- RONS has been described in the article “Polyatomic Liquid Oxygen (PLO): A new methodology for the production in aqueous solution of reactive oxygen and nitrogen species (RONS) to be applied in medical treatments” (G:Barco, International Patent WO/219/07739). Not only, in the same article there are also listed in details all the species highly reactive of the oxygen (ROS) and of the nitrogen (RNS), and have been reported the individual chemical physical systems used for their emphasized and respective concentration in the mixtures OPL-RONS.

Radical species present in the mixtures of Polyatomic Liquid Oxygen (PLO – RONS)

In the mixtures OPL-RONS, the superoxide paramagnetic anion is the most represented radical species; there are only traces of idrossil radicale and ossigeno singoletto. In the mixtures of Polyatomic Liquid Oxygen (PLO – RONS) there have been emphasized traces of two species highly reactive of the nitrogen: nitric oxid and peroxynitrite (ONOO⁻), who make the mixture radical and oxidative exclusive. Sometimes it is possible to find in the mixture OPL-RONS molecules of O₄, an ephemeral allotropic form of oxygen.

To be fair, ozone molecules have never been found in the aqueous radical mixtures of Polyatomic Liquid Oxygen (PLO – RONS).

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Why is PLO – RONS called Polyatomic?

The aqueous radical mixtures PLO – RONS belong to the group of polyatomic compounds, because they are mixtures consisting of various chemicals elements of the periodic table. In this case, molecules consisting of oxygen, nitrogen and hydrogen.

The polyatomic mixtures differ from monoatomic mixtures because in the latter it is possible to identify only one type of chemical element, as in the case of the mixtures of oxygen and of oxygen-ozone, which consist of only one chemical element: oxygen.
Often, wrongly, the term “polyatomic” is used to indicate solutions consisting of several atoms, but in nature there are no mixtures consisting of a single atom.

**Why is PLO – RONS called Liquid?**

The radical aqueous solution PLO – RONS is defined “liquid” for two important reasons: the first for the “liquid phase” in which the mixture is at room temperature; but the second reason, most important, is the state of hydration in which the species (ROS and RNS) are present in them as solutes. The state of hydration makes the molecules RONS more stable and less reactive than the corresponding anhydrous forms, thus giving a more durable half-life to the mixtures PLO – RONS\(^2\), making them more stable after they have been administered.

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**Why is PLO – RONS mixture called Radical-Oxidative, and the mixture of oxygen-ozone only oxidative?**

The mixture OPL-RONS, taking into consideration the pH and the temperature of the tissues in which it is administered, expresses an oxidation number (n.o.) between 3 and 1.5, and never equal to zero due to the presence of highly reactive molecules of oxygen and nitrogen (RONS). In chemistry, a mixture with a non-zero and positive number can be considered in all ways as a mixture with oxidative radicalic activity. The mixtures based on oxygen and oxygen-ozone used in the medical practice express a zero oxidation number; and therefore they can only be inserted between oxidative mixtures and they cannot be inserted between mixtures with oxidative radicalic activity.

**What is the use of the Aqueous Radical Oxidative mixture OPL-RONS?**

The Aqueous solution OPL- RONS activates mitochondrial oxidative phosphorylation, greatly increasing the production of cellular energy (ATP), and this due to the presence of superoxide ion.

The superoxide ion, for its characteristic charge/ volume ratio higher than that of molecular oxygen (\(O_2\)), makes the mixture OPL- RONS express standard reduction potential values higher than those of molecular oxygen and in environments with pH slightly below neutrality,,, express values higher than those of pure water (\(1/2\) oxygen/water) slightly greater than 0.82 Volt. The superoxide ion thanks to the standard reductio potential more favorable than that of water, starts the mitochondrial oxidative phosphorylation, while downstream the molecular oxygen will be the last electron acceptor, thus promoting mitochondrial respiration and energy production.

The human organism produces about 1.5 kg of superoxide ion per year, but in particular pathological conditions, the mitochondrial production
may be reduced progressively; and that is the case of aging, of the degenerative diseases of the central nervous system, and of the inflammatory musculoskeletal diseases. In his type of pathologies, the aqueous radicalic oxidative mixture OPL-RONS is particularly advantageous for restoring energy-producing oxidative metabolism mitochondrial (ATP).

In cancer cells, the mitochondrial production of superoxide ion is completely blocked to the point that the energy of the cancer cell is obtained only by burning glucose \(_1\) (aerobic glycolysis). During administration in oncological tissues of aqueous radicalic oxidative mixtures OPL-RONS rich in superoxide ion, direct observations have shown that they lead to death the cancer cells for apoptosis.

The reactive species of nitrogen (RNS) contained in the aqueous radicalic oxidative solutions OPL-RONS play an important biological role, both as an antiviral for the presence of peroxynitrite, and as regulation of the vasodilatator mechanisms of the district blood flow thanks to the presence of nitric oxide (NO).

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**Polyatomic Liquid Oxygen and Ozone Polyatomic Liquid, are they the same thing?**

Polyatomic Liquid Oxygen (OPL-RONS) is an aqueous radicalic mixture, saturated of reactive species of oxygen (ROS) and nitrogen (RNS), rich in paramagnetic superoxide anion (O\(_2\)), and the stability of the (ROS) and of the (RNS) depends on their hydrated state (solvatation). It should also be emphasized that the aqueous mixtures of Polyatomic Liquid Oxygen (OPL-RONS) are to be counted among the mixtures with radicalic oxidative activity as they express positive oxidation number and others than zero. Ozone instead is an allotrophic form of the oxygen, very unstable; and its use is based on administration of homoatomic gas mixtures consisting of only oxygen.

Often, in the medical field we talk about Ozone Polyatomic Liquid, a chemical reality that cannot exist in nature; and this because the ozone is a molecule who, due to its electronic instability cannot exist in hydrated form and therefore It cannot constitute a liquid phase and cannot even constitute a polyatomic mixture because it consists of only oxygen. The mixtures of oxygen/ozone used in medical practice are only in the gas phase; they are composed up by 6 % ozone, and for the remaining 94% only by molecular oxygen; the mixtures have only oxidative and non radicalic activity and they express oxidation number equal to zero.