

# FIBER MEMBRANE OXYGENATOR WITH MINIMIZED PRIMING VOLUME

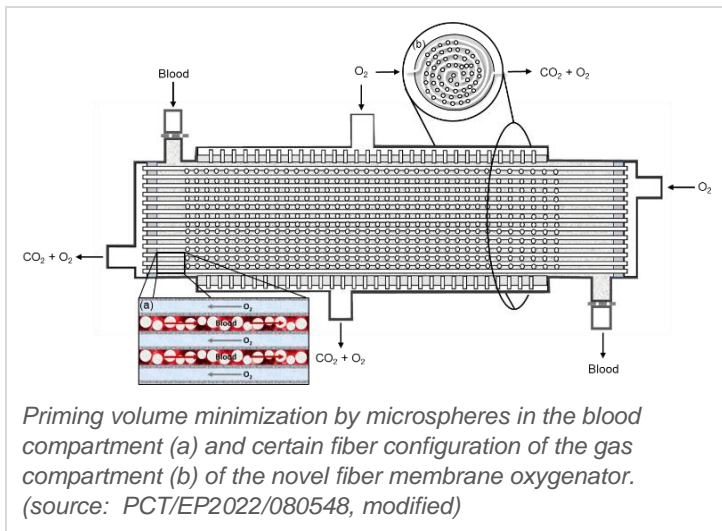
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## INVENTION NOVELTY

Researchers at Charité - Universitätsmedizin Berlin have developed novel strategies for minimizing priming volume in fiber membrane oxygenators to support lung function in cardiopulmonary bypass, and to oxygenate blood in long-term life support (extracorporeal membrane oxygenation, ECMO). The priming volume can be significantly reduced by using 50 to 200  $\mu\text{m}$  microspheres and/or a certain fiber configuration, resulting in the reduction of the diffusion path length by approx. 70% of existing commercial oxygenators, allowing to reduce the oxygen saturation length by approximately a factor of three and improving convective transport by a secondary flow thus in sum allowing miniaturization and implantable artificial lungs development.

## VALUE PROPOSITION

ECMO is widely used for a variety of cardiac and pulmonary diseases in which hypoxia of the blood occurs, including the treatment of COVID-19 patients with severe disease progression. Currently, the use of oxygenators for ECMO is associated with a set of thrombus-induced complications including neurological injuries or even brain death as well as acute kidney injury. These complications are caused by the low efficiency of current oxygenators due to high priming volume of 40 to 50% of total oxygenator volume. Reducing the priming volume with higher efficiencies leads to safer oxygenators causing less complications and enables the future development of miniaturized oxygenators such as implantable artificial lungs which is essential for patients waiting for lung transplants.



## TECHNOLOGY DESCRIPTION

The mean thickness of the blood film between neighboring gas compartments (microfibers) and thus the gas exchange rate is increased by a certain fiber configuration and/or using microspheres in the blood compartment. Furthermore, the microspheres are freely movable in the blood stream, eliminating stagnation flow conditions which together with recirculation regions are the main factors promoting thrombus formation. The herein proposed oxygenator with priming volume minimization thereby overcomes major general obstacles in the development of blood contacting artificial devices and has the potential to enable miniaturized and implantable, highly efficient artificial lungs.

## COMMERCIAL OPPORTUNITY

We are looking for a licensing or/and cooperation partner.

## DEVELOPMENT STATUS

Flow simulations and gas exchange calculations have been performed and a prototype of a fiber membrane oxygenator using microspheres for priming volume minimization has been realized at Charité - Universitätsmedizin Berlin. Oxygenation tests proved the concept feasibility. Currently, hemolysis tests are under preparation.

## PATENT SITUATION

European patent application PCT/EP2022/080548 has been filed in 2022.