

## Three O2Amp Technologies

O2Amp provides a suite of three distinct patented eyewear technologies that enhance perception of distinct facets of the vasculature. It amounts to a tool kit for augmented perception of vasculature and health.

▶ **Oxy-Iso Vein-Finder:** Isolates and enhances perception of blood oxygenation under the skin, and eliminates perception of blood concentration.

▶ **Hemo-Iso Blood and Bruise-Finder:** Isolates and enhances perception of blood concentration under the skin, and eliminates perception of blood oxygenation.

▶ **Oxy-Amp Vein Paramedic Glasses, and Diagnosis-Enhancing Medical Protective Glasses (also a vein finder):** Amplifies perception of blood oxygenation – and veins – under the skin, without compromising the perception of blood concentration. Boosts general perception of health-related signals, including vasculature, bruising, cyanosis, pallor, rashes and erythema.

*For illustrations of what one sees, see our blood specs page.*

The eye (unless one is color-deficient) can see two distinct dimensions of blood-related spectral change: (i) oxygenation variations, and (ii) concentration variations. The Oxy-Iso above amplifies (i) at the expense of (ii). The Hemo-Iso amplifies (ii) at the expense of (i). That's why each uses the monicker "Iso", for "Isolator" – because each isolates perception to just one of the two dimensions. By eliminating perception of the other dimension, it becomes even easier to perceive the wanted dimension. Each works via a filter that selectively passes through only wavelength bands where the signal – (i) or (ii) – undergoes the greatest variations.

The Oxy-Amp differs from the two "Isos" in that rather than focusing on one or the other signal, it amplifies the oxygenation signal but without hindering the concentration signal. This is the flagship O2Amp product because it is able to enhance perception of oxygenation while maintaining one's normal perceptuo-clinical sense. The mechanism underlying it is also different: The Oxy-Amp blocks very narrow wavelength "slivers" of counter-signal for the detection of oxygenation variations. It is because these slivers of spectral noise are so small that the Oxy-Amp is able to boost perception of vasculature without hindering clinical perception.

Note also that the Oxy-Iso (the first of the three technologies mentioned above) has become the major eyewear solution for color deficient medical personnel. Doctors and nurses rely on color vision for diagnosing illness. Red-green colorblindness robs them of the ability to see numerous medical signs. It can be practically impossible for color deficient to see veins, vasculature, pallor, cyanosis, jaundice, rashes, bruising, erythema, retinal damage, ear and throat inflammation, blood in excretions, and even medical charts and graphs. These handicaps are due to their deficiency at detecting variations in oxygenation, which is what we at 2ai Labs have shown that color vision in primates evolved to detect (see Changizi et al., Biol Letters 2: 217-221, <http://www.changizi.com/colorface.pdf>). The Oxy-Iso aids color-deficients by enhancing the oxygenation signal, which is exactly what their red-green deficiency is deficient at. For more information, see our Health Blindness page.

## Design Advantages

O2Amp technology enhances one's ability to detect vasculature and veins, but we do not view ourselves as direct competitors with other vein detection devices. An infra-red viewing device, for example will often make veins stand out more clearly than they do with our Oxy-Iso or Oxy-Amp. Our eyewear is complementary, and designed with some very different advantages in mind, advantages making our technology uniquely suited for expeditionary use.

▶ **Durability:** O2Amp technology is passive, so there is no battery, no electricity, no wires. It is built via custom-designed dye within the polycarbonate material itself, and so the filtering properties can't be rubbed or scraped off through wear.

▶ **Dual Use:** The eyewear is meant to provide eye protection needed in medical or other situations. But rather than having eyewear on that provides no medical benefit, our technology provides enhanced perception of health signals. The eyewear can also be treated as needed to double as sunwear (e.g., added polarization, etc.).

▶ **Low cost:** Our eyewear has a much lower price point than vasculature identification devices. With a sufficiently large bulk order, the price point can drop enough that our eyewear might in some cases be treated as disposable.

▶ **ANSI Z87.1:** Our eyewear have passed ANSI Z87.1 "basic impact" protective-eyewear tests. Manufacturing is in place to get each pair labeled with ANSI Z87.1 certification.

▶ **Hands free:** Some vein identification technologies require holding a light against the skin, or in some way require the use of one of one's hands. O2Amp eyewear leaves both hands free.

▶ **White light:** O2Amp just needs sufficiently bright white light – no special lighting is required. Some technologies require red or infra-red light, and require that other lights be extinguished. O2Amp is designed to work within the visible spectrum. Ideal conditions are indoors with a strong white lamp or headlamp, or outdoors during day time.

▶ **Exploits normal senses:** The Oxy-Amp in particular (the third of the three technologies mentioned earlier) is designed to strictly enhance vascular and clinical perception, thus allowing full use of one's normal skills at sensing vasculature and its clinical implications. (This cannot be said of other vein-detection devices, nor even of our other two O2Amp technologies – the two "Isos".)

▶ **Aids color-deficient medical personnel:** The Oxy-Iso (the first of the three technologies mentioned earlier) enhances visibility of oxygenation variations for red-green color-deficients, thus raising their clinico-perceptual sense upward toward that of color-normals.

## Manufacturing Capability

Our manufacturing occurs both in the U.S. and in Hong Kong, and we can fill large volumes with considerable diversity of lens and frame types, as well as with ANSI Z87.1 certification.

In production and sale at the moment are:

- ▶ Framed eyewear of the three technologies.
- ▶ Lens blanks (two curve types, namely 6-base and 8-base).
- ▶ Clip-on lens blanks.
- ▶ Mirrored lenses and framed eyewear.
- ▶ Prescription-grindable lens blanks (allowing prescription lenses).
- ▶ Filtered light bulbs.

Prototypes we have manufactured but not yet marketed include:

- ▶ Polarized sunglasses-style lens blanks (five color-types) with our Oxy-Amp tech inside.
- ▶ Window sheets (1mm and 3mm).
- ▶ Window film.
- ▶ Paint.

The final three above allow us to apply our filter properties to a wide variety products after the fact.

## Background Science

O2Amp technology comes out of research from 2ai Labs concerning the evolutionary origins of color vision. In 2006 we discovered that color vision in primates – and us – is optimized for sensing oxygenation variations in the skin (see <http://www.changizi.com/-colorface.pdf> ). This is what allows us to sense emotions and health. In light of understanding the design function of color vision, we were in the unique position to enhance what color vision allows us to see.