

# Carbon dioxide Expanded ethanol extraction of astaxanthin from microalgae

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Astaxanthin has been approved by the FDA (Food and Drug Administration) as a food supplement since 1999. This xanthophyll carotenoid contains two additional oxygenated groups on each ring structure compared with other carotenoids resulting in enhanced antioxidant properties. Among all the micro-algae producing astaxanthin, *Haematococcus Pluvialis* is the one which accumulate the most (up to 4–5% of cell dry weight). Supercritical CO<sub>2</sub> extraction can extract only 50% of astaxanthin in the microalgae (P=500 bars, T=70°C). With addition of a co-solvent, 80% of astaxanthin had been extracted. An alternative to supercritical fluids is to add compressed (liquefied) CO<sub>2</sub> to a conventional organic solvent, giving a so-called CO<sub>2</sub>-expanded liquid (CXL). In terms of properties, dissolving compressed CO<sub>2</sub> in an organic solvent decreases its dielectric permittivity and subsequently its polarizability as well as its solubility parameters. With 65% ethanol in CO<sub>2</sub> at 90 bars and 40°C, 100% of astaxanthin had been extracted from *Haematococcus Pluvialis*.