Hash BioTech Limited

A Group Company of Hash Group

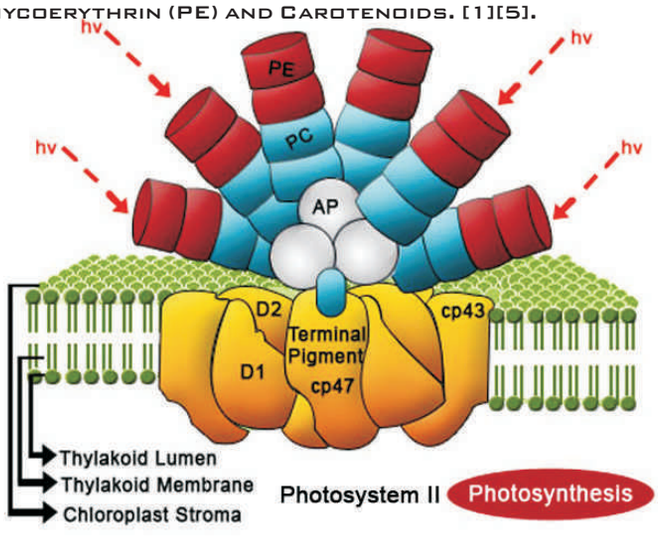
C-PHYCOCYANIN

Characteristics	
Molecular Weight	: 232KDa
Composition	: C-Phycocyanin comprises of two subunits α and β of molecular weight in the range of 18KDa & 20KDa respectively.
Purity	: A_{620}/A_{280} 3.5-4
Absorption Maxima	: 620 nm
Emission Maxima	: 647 nm
Extinction Coefficient	: E1% at 620 = 70
Isoelectric Point	: 4.65
Source	: *Spirulina platensis*
Origin	: India

C-Phycocyanin (C-PC) occurs as the cyanobacterial phycobiliprotein with high fluorescence quantum yield, molar extinction coefficients, absorbtivity and stability. It can be easily cross linked with antibodies and other proteins by using conventional molecular tagging techniques without losing its fluorescent properties.

Because of its miraculous fluorescence properties, it may be used as a fluorescent biomarker with proteins, antibodies and nucleic acids for diagnosing the various lethal diseases and in different diagnostic kits. It is also used as a straight marker in various applications like FRET assays, fluorescence microscopy, fluorescence activated cell sorting (FACS), fluorescence in situ hybridization (FISH), fluorescence correlation spectroscopy (FCS), gel electrophoresis, isoelectric focusing and gel exclusion chromatography.

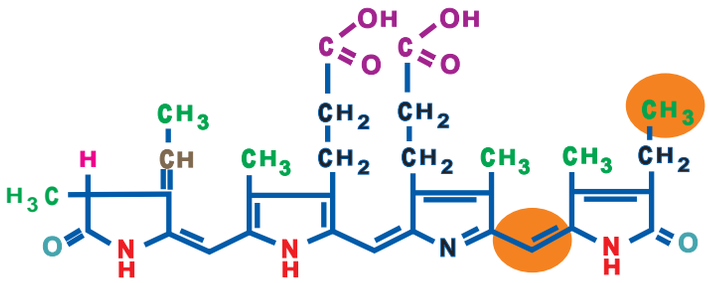
The filamentous prokaryotic cyanobacterium *Spirulina platensis* is a rich source of Phycocyanin which also possesses a wide range of colored components i.e. Chlorophyll, Allophycocyanin (APC), Phycoerythrin (PE) and Carotenoids. [1][5].



Assembly of phycobilisome

The phycobiliproteins are antennae-protein pigments involved in light harvesting and are organized in supramolecular complexes, called phycobilisomes (PBSs), those are assembled in regular arrays on the outer surface of the thylakoid membranes.

In cyanobacteria four main classes of phycobiliproteins exist: allophycocyanin (APC, bluish green), phycocyanin (PC, blue), phycoerythrin (PE, purple), and phycoerythrocyanin (PEC, orange).

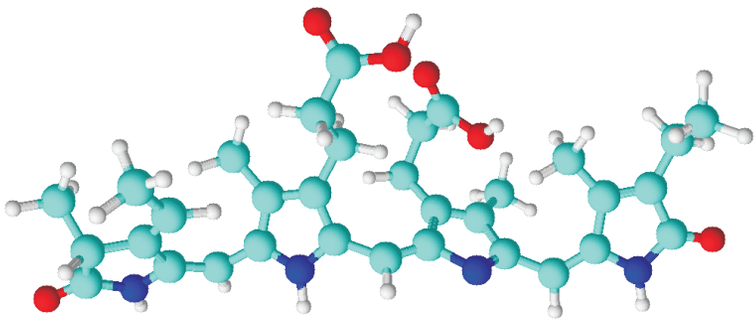


Molecular Skeleton of C-Phycocyanin

Phycobiliproteins are oligomeric proteins, built up from chromophore-bearing polypeptides belonging to two families (α and β) probably originating from a common ancestor [2].

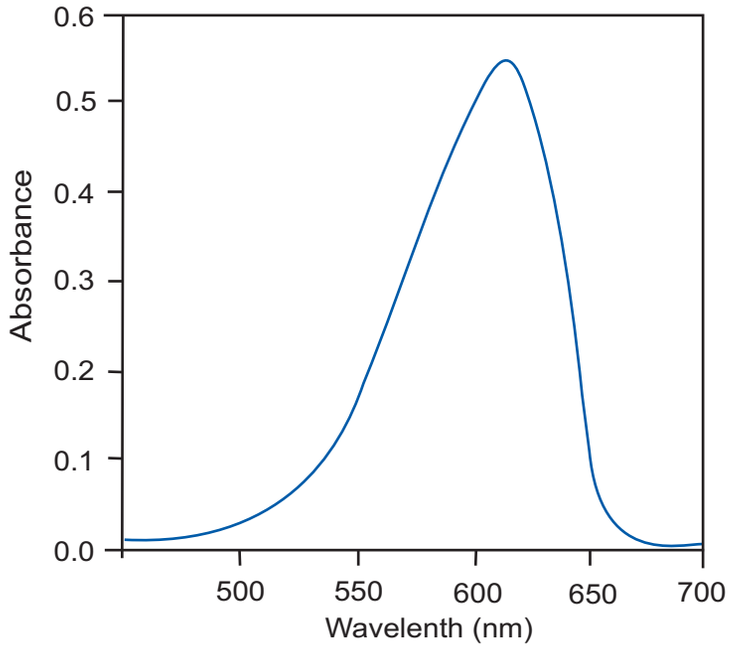
The colors of phycobiliproteins originate mainly from covalently bound prosthetic groups that are open-chain tetrapyrrole chromophores bearing A, B, C and D rings named phycobilins.

These chromophores are generally bound to the polypeptide chain at conserved positions either by one cysteinyl thioester linkage through the vinyl substituent on the pyrrole ring A of the tetrapyrrole or occasionally by two cysteinyl thioester linkages



Three Dimensional
Molecular Structure of C-Phycocyanin

Oxygen
Carbon
Nitrogen
Hydrogen



Spectroscopic characterization of purified C-PC in 5 mM sodium phosphate buffer, pH 7.0. Absorption spectrum of C-PC, spectrum recorded at room temperature.

Table showing spectroscopic characters of pigments[3]

S.No.	Pigment	Absorption Maxima(in nm)	Emission Maxima(in nm)
1.	Allo-phycocyanin	650-655	660
2.	C-Phycocyanin	615-640	637
3.	Phycoerythrin	565-575	577

Application of C-Phycocyanin

Phycobiliproteins play an important role in fluorescent based detection systems, particularly for flow cytometry. The spectral properties, such as:

- Excitation and emission at the red end of the spectrum, where interference from biological matrices tend to be less.
- A large Stokes shift, so that interference from Rayleigh and Raman scatter and other fluorescing components is less significant or nonexistent.
- Immunity from quenching by naturally occurring biological substances.
- High solubility in aqueous environment so that nonspecific binding effects are minimal.

Synthesis of conjugates of phycobiliproteins with molecules having biological specificity, like immunoglobulins, protein A, biotin and avidin, were reported and showed that phycobiliproteins conjugates are excellent reagents for two color fluorescence analysis of single cells using fluorescence activated cell sorter (FACS) [4].

A photochemical method is described for treating cancer wherein Phycocyanin is administered to a patient suffering from internal or skin cancer. Once administered, Phycocyanin is selectively taken up into cancer cells, and upon subsequent irradiation destruction of the cancer cells occurs.

The Pharmacological property attributed by Phycocyanin includes antioxidant, anti-nflammatory, europrotective and hepatoprotective activity.

When it was evaluated as an antioxidant *in vitro*, it was able to scavenge alkoxyl, hydroxyl and peroxyl radicals, and inhibits microsomal lipid peroxidation induced by Fe^{+2}–ascorbic acid or the free radicals initiators 2, 2' Azobis (2- amidinopropane) dihydrochloride, (AAPH). They also reduced edema, histamine (Hi) release, myeloperoxide (MPO) activity and the levels of prostaglandin (PGE2) and leukotriene (LTB4) in the inflamed tissues [6][7].

Phycocyanin selectively impregnate biological structures including atherosclerotic plaque and tumors. Imaging of biological structures can be enhanced by tagging to a Phycocyanin an atom which is compatible with the complementary to any of the imaging modalities [9].

The tagged Phycocyanin can then be administered to a subject. The improvement can be utilized to enhance images of all structures, arterial wall thickness, atherosclerotic plaque, luminal boundaries and to better delineate tumors mass outlines [8].

C-Phycocyanin derived from *Spirulina platensis* powerfully influenced serum cholesterol concentrations and imparted a stronger hypocholesterolemic activity[10]

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