CLAIMS

1. An isolated enzyme complex comprising;

a) a cofactor,

b) a first enzyme that requires the cofactor to perform an enzymatic reaction, and

c) a second enzyme that recycles the cofactor,

wherein the first enzyme, second enzyme and cofactor form the enzyme complex through covalent attachments, and wherein the cofactor is covalently attached to the enzyme complex via a tether that allows the cofactor to be used by the first enzyme and recycled by the second enzyme,

wherein the first enzyme is selected from the group consisting of:

i) a kinase;

ii) a dehydrogenase;

iii) an oxygenase;

iv) an aldolase;

v) a reductase;

vi) a synthase,

and/or,

the second enzyme is selected from the group consisting of:

i) a kinase;

ii) a dehydrogenase;

iii) an oxidase;

iv) a reductase;

v) a peroxidase.

2. The enzyme complex of claim 1, wherein the cofactor is selected from the group consisting of ATP/ADP, NAD+/NADH, NADP+/NADPH, and FAD+/$FADH_2$.

3. The enzyme complex of claim 1 or claim 2, wherein the cofactor has a ribonucleotide core.

4. The enzyme complex according to any one of claims 1 to 3, wherein the tether comprises a polyethylene glycol (PEG) chain, hydrocarbon chain, a polypeptide or polynucleotide.

5. The enzyme complex according to any one of claims 1 to 4, wherein the cofactor is tethered to one of the enzymes.

6. The enzyme complex according to any one of claims 1 to 5, wherein the first and second enzymes are covalently attached by a linker.

7. The enzyme complex of claim 6, wherein the cofactor is tethered to the linker.

8. The enzyme complex according to any one of claims 1 to 7, wherein the complex comprises:

i) *Thermococcus kodakarensis* glycerol kinase, *Mycobacterium smegmatis* ATP kinase, ATP/ADP;

ii) *Escherichia coli* glycerol-3-phosphate dehydrogenase, *Clostridium aminovalericum* NADH oxidase, NAD/NADH;

iii) *Shewanella* yellow enzyme, *Geobacillus thermodenitrificans* alcohol dehydrogenase, NAD/NADH;

iv) *Geobacillus thermodenitrificans* alcohol dehydrogenase, *C. boidinii* formate dehydrogenase, NADP/NADPH; or

v) *Bacillus subtilis* yellow enzyme, *C. boidinii* formate dehydrogenase, NADP/NADPH.

9. The enzyme complex according to any one of claims 1 to 7, wherein the complex comprises:

i) *Thermococcus kodakarensis* glycerol kinase, *Mycobacterium smegmatis* ATP kinase, ATP/ADP, *Alicyclobacillus acidophilus* esterase; or

ii) *Escherichia coli* glycerol-3-phosphate dehydrogenase, *Clostridium aminovalericum* NADH oxidase, NAD/NADH, *Alicyclobacillus acidophilus* esterase.

10. The enzyme complex according to any one of claims 1 to 9 further comprising a covalently attached conjugation module for conjugating the complex to a solid support.

11. The enzyme complex according to any one of claims 1 to 10 which is covalently or non-covalently attached to the solid support.

12. The enzyme complex of claim 11, wherein the solid support is a functionalised polymer and/or is in the form of a bead, a matrix, a woven fibre or a gel.

13. The enzyme complex of claim 12, wherein the functionalised polymer is selected from the group consisting of: agarose, cotton, polyacrylonitrile, polyester, polyamide, protein, nucleic acids, polysaccharides, carbon fibre, graphene, glass, silica and polyurethane.

14. A method for producing the enzyme complex according to any one of claims 1 to 13, the method comprising:

i) expressing a polynucleotide encoding a chimeric protein comprising the first enzyme and the second enzyme in a host cell or cell-free expression system; and

ii) attaching the cofactor to the chimeric protein via the tether.

15. A method for producing a product, the method comprising,

i) providing an enzyme complex according to any one of claims 1 to 13 and a substrate of the first enzyme, and

ii) incubating the enzyme complex and substrate for a time and under conditions sufficient for the first enzyme to convert the substrate to the product and for the second enzyme to recycle the cofactor for use by the first enzyme.

16. The method of claim 15 which comprises two or more enzymatic steps and at least two of the enzymatic steps are performed using two different enzyme complexes according to any one of claims 1 to 13.

17. The method of claim 15 or claim 16 which is performed in a bioreactor.

18. A bioreactor comprising at least one enzyme complex according to any one of claims 1 to 13.

19. A composition comprising at least one enzyme complex according to any one of claims 1 to 13.