CLAIMS

What is claimed:

1. An expression construct comprising:

   a nucleic acid sequence for a crtW carotenoid ketolase gene from *Brevundimonas* strain OB307 that encodes the amino acid sequence of SEQ ID NO: 2, the expression construct adapted to produce carotenoids in a heterologous biological host cell.

2. The expression construct of claim 1, wherein the expression construct is a plasmid.

3. The expression construct of claim 1, wherein the expression construct is integrated into a genome of the biological host cell.

4. A method of producing a nucleic acid sequence encoding a crtZ-crtW carotenoid hydroxylase-ketolase fusion protein of SEQ ID NO: 4, the method comprising:

   obtaining a crtW gene from a species of *Brevundimonas,*

   adding a sequence encoding a ten amino acid linker peptide of SEQ ID NO: 4 and 5 to the 3'-end of the crtW sequence;

   adding a sequence encoding a crtZ gene lacking the N-terminal methionine codon and containing a 3' stop codon to the 3'-end of the linker peptide sequence; and

   inserting the entire DNA construct into an expression vector.

5. The method of claim 4, wherein the nucleic acid sequence is part of an expression construct adapted to produce carotenoids when functionally integrated into a biological host cell.

6. The method of claim 4, wherein the fusion protein is further expressed in a biological host cell capable of using CO_2 and H_2 to satisfy at least part of its carbon and energy requirements.

7. The method of claim 4, wherein the crtW sequence is a ketolase gene from *Brevundimonas* strain OB307 that encodes the amino acid sequence of SEQ ID NO: 2.

8. The method of claim 4, wherein the nucleic acid sequence is adapted to produce carotenoids when functionally integrated in a biological host cell.

9. An expression construct encoding a crtZ-crtW carotenoid hydroxylase-ketolase fusion protein of SEQ ID NO: 4, wherein

   (a) the crtW portion of the fusion is a ketolase gene from *Brevundimonas* strain OB307 that encodes the amino acid sequence of SEQ ID NO: 2, and

   (b) the nucleic acid sequence is adapted to produce carotenoids when functionally

integrated in a biological host cell.