1. Carvone oxide can be converted to the desired product through a series of reactions. Initially, treating carvone oxide with TsNHNH₂ in THF at -10 °C followed by MgBr at -78 °C yields an intermediate. Subsequent treatment with CuCl₂ in acetone results in 48% yield with >20:1 d.r.

2. Under irradiation with 254 nm light in pentane, the mixture undergoes a photoreaction, producing a product with 67% yield. Further treatment with m-CPBA in CH₂Cl₂ leads to a conjugate addition product with 82% yield. The reaction is described in detail in Sugimura's Tetrahedron:Asymmetry, 15 (2004) 1409–1417.
3.

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\text{[(PPh}_{3}\text{Au})_3\text{O}]BF_4 \quad (1 \text{ mol\%})
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DCE, 75 °C, 84%