

## **Amplification with a Gain by Quantum-Chain Reactions in Crystalline Solids**

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The photochemical decarbonylation of diphenylcyclopropanone (DPCP) to diphenyl acetylene (DPA) proceeds with remarkable efficiency both in solution and in the crystalline solid state. We have shown that excitation to S<sub>2</sub> in crystalline solids proceeds by a quantum chain process where the excited photoproducts transfer energy to neighboring molecules of unreacted starting material, which are able to propagate the chain. Quantum yields in nanocrystalline solids revealed quantum yield amplification factors that range from 320% to 1100%. The mechanical response of the solid-to-solid reaction was documented with macroscopic crystals, where large single crystalline specimens turn into fine powders. Reactions at the nanometer scale investigated with AFM showed the formation of DPA as isolated crystallites of ca. 35 nm in size.