Emission of CO₂, a byproduct from many industrial processes and power plants, has increased with increasing energy demand and growing population. Most of the efforts to chemically reduce CO₂ requires the use of H₂. This is not desirable because at present ~95% of H₂ is generated from hydrocarbon-based feedstock, producing CO₂ as a byproduct. In this talk we will first give a brief summary on CO₂ conversion by H₂ [1,2], followed by discussing our recent efforts in converting CO₂ by light alkanes, such as ethane, via the dry reforming pathway to produce synthesis gas (C₂H₆ + 2CO₂ → 4CO + 3H₂) or the oxidative dehydrogenation route to generate ethylene (C₂H₆ + CO₂ → C₂H₄ + CO + H₂O). Using a combination of kinetic studies, in situ characterization and DFT calculations, we have identified several classes of catalysts that can activate both CO₂ and light alkanes (C₂-C₄) [3,4] to achieve selective dry reforming or oxidative dehydrogenation. Finally, we will discuss alternative pathways for N₂ transformations, which are the most CO₂-emitting chemical processes [5].