

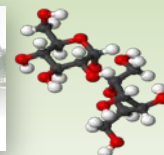
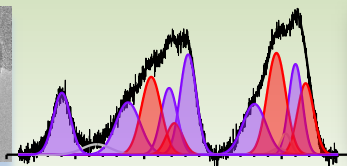
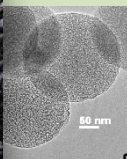
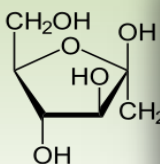
CO₂ Strategy for Coal-to-Liquids

Uschi M. Graham

Center for Applied Energy Research

graham@topasol.com

West Virginia 2014 Energy Summit



C O 2

S T R A T E G Y

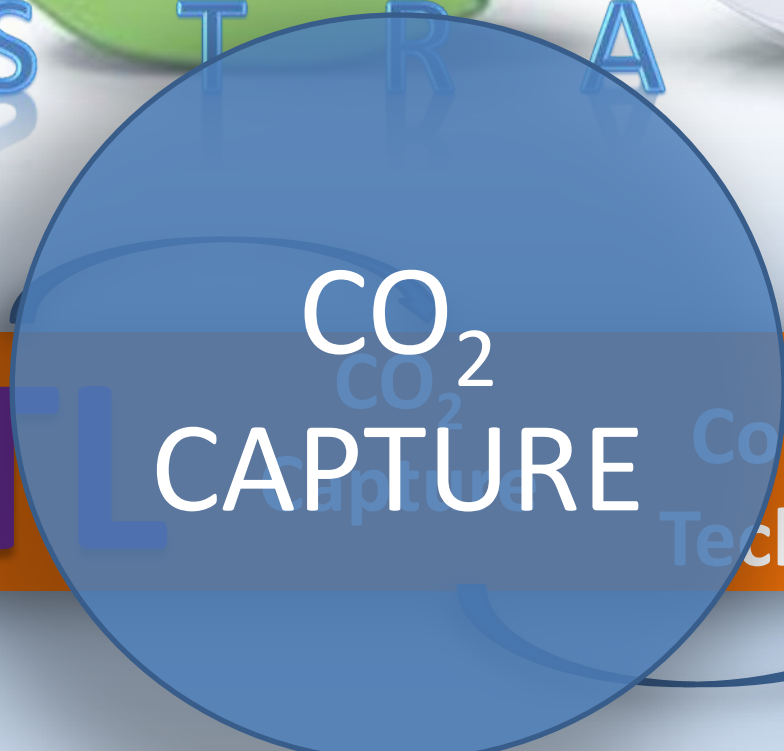


CTL
COAL

>



GTL
GAS



CT

CO₂
CAPTURE

Conversion
Technologies

REUSE

CTL



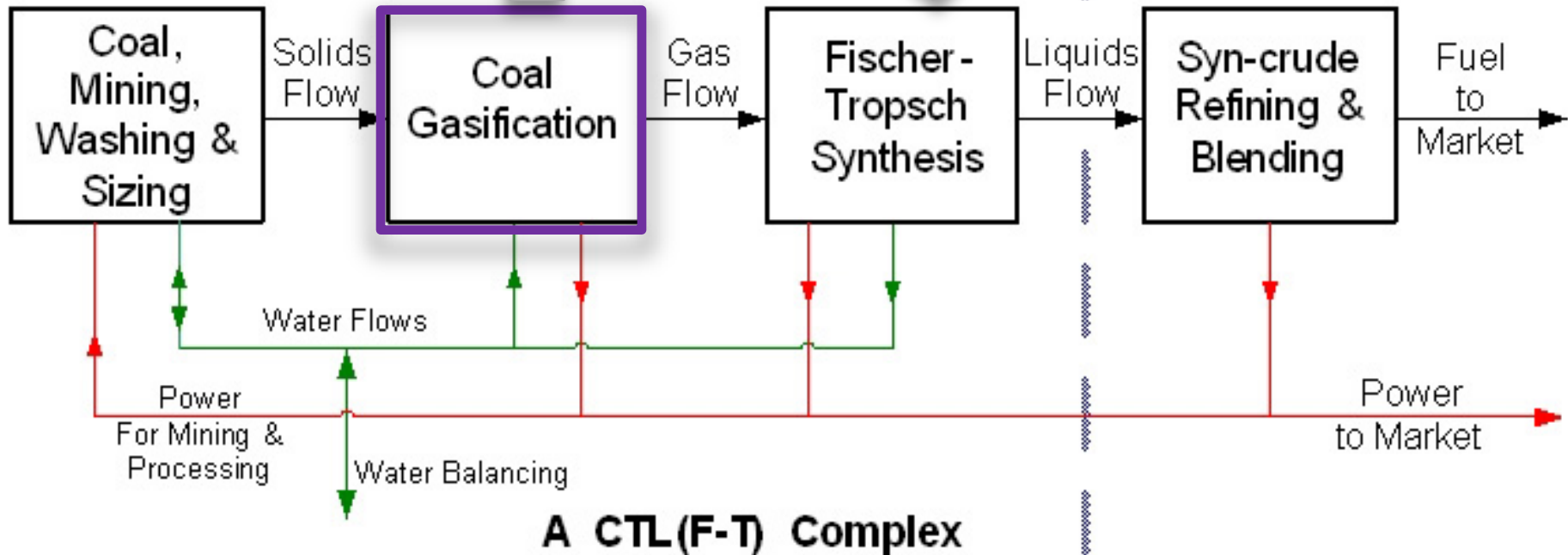
Gas-Cleaning

Mercury/Ash/99-99.9% S removal

SelexolTM

RectisolTM

CO₂
removal
REUSE



SelexolTM
RectisolTM

Mercury/
Ash/S

CO₂
STRATEGY

SynGas

Gasification



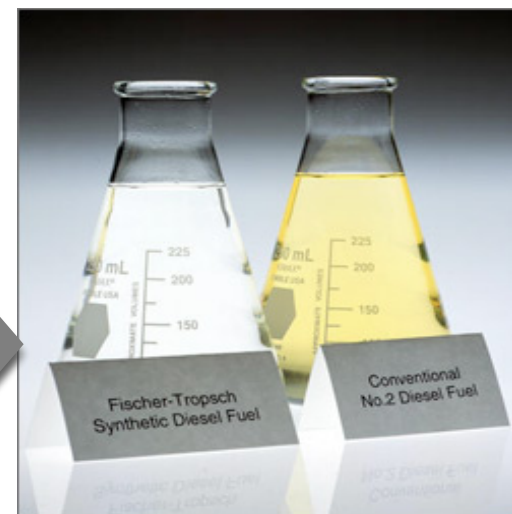
CO : H₂

WGS

CO₂

CO : H₂
SynGas

FT-
Synthesis

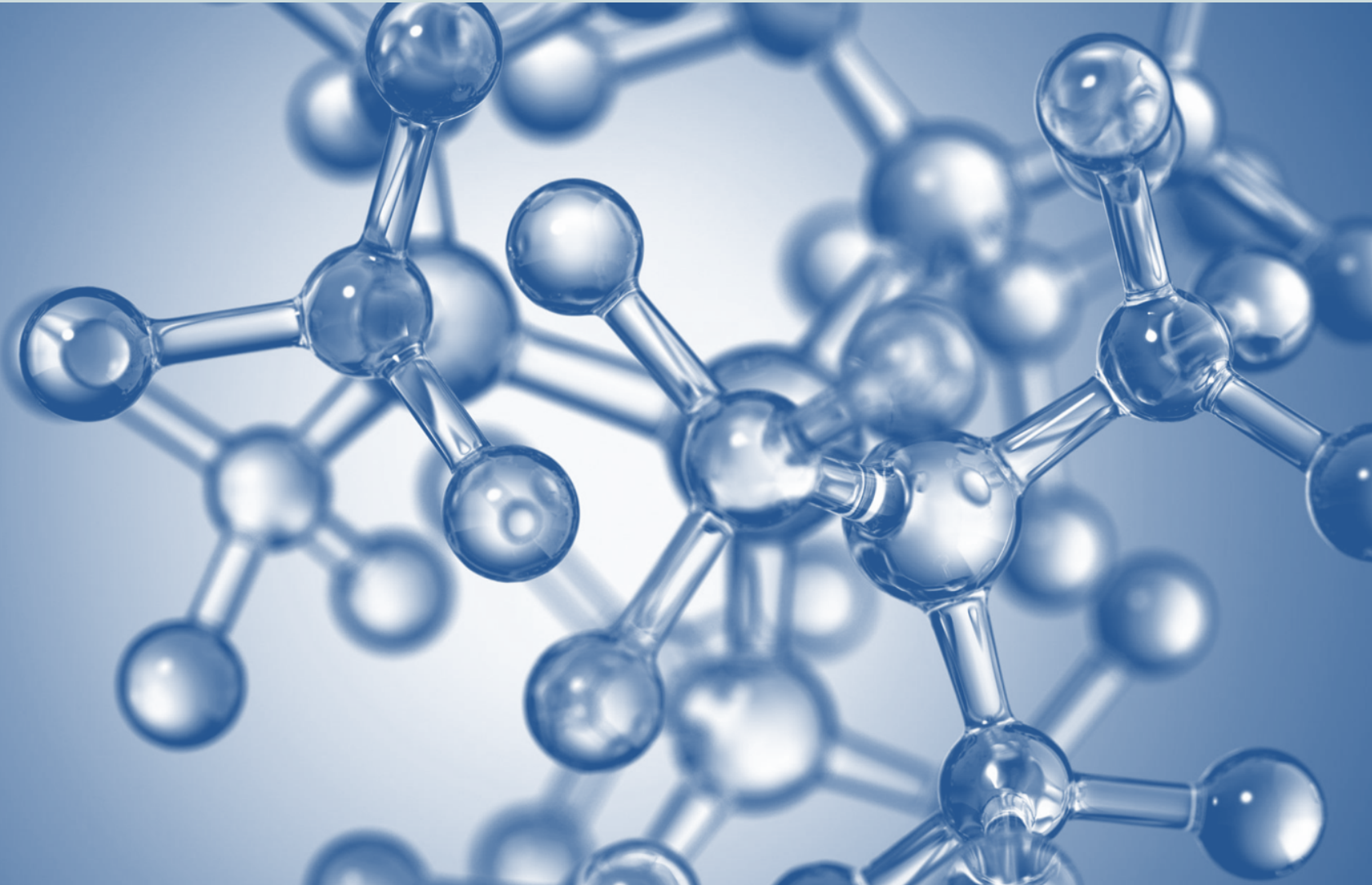


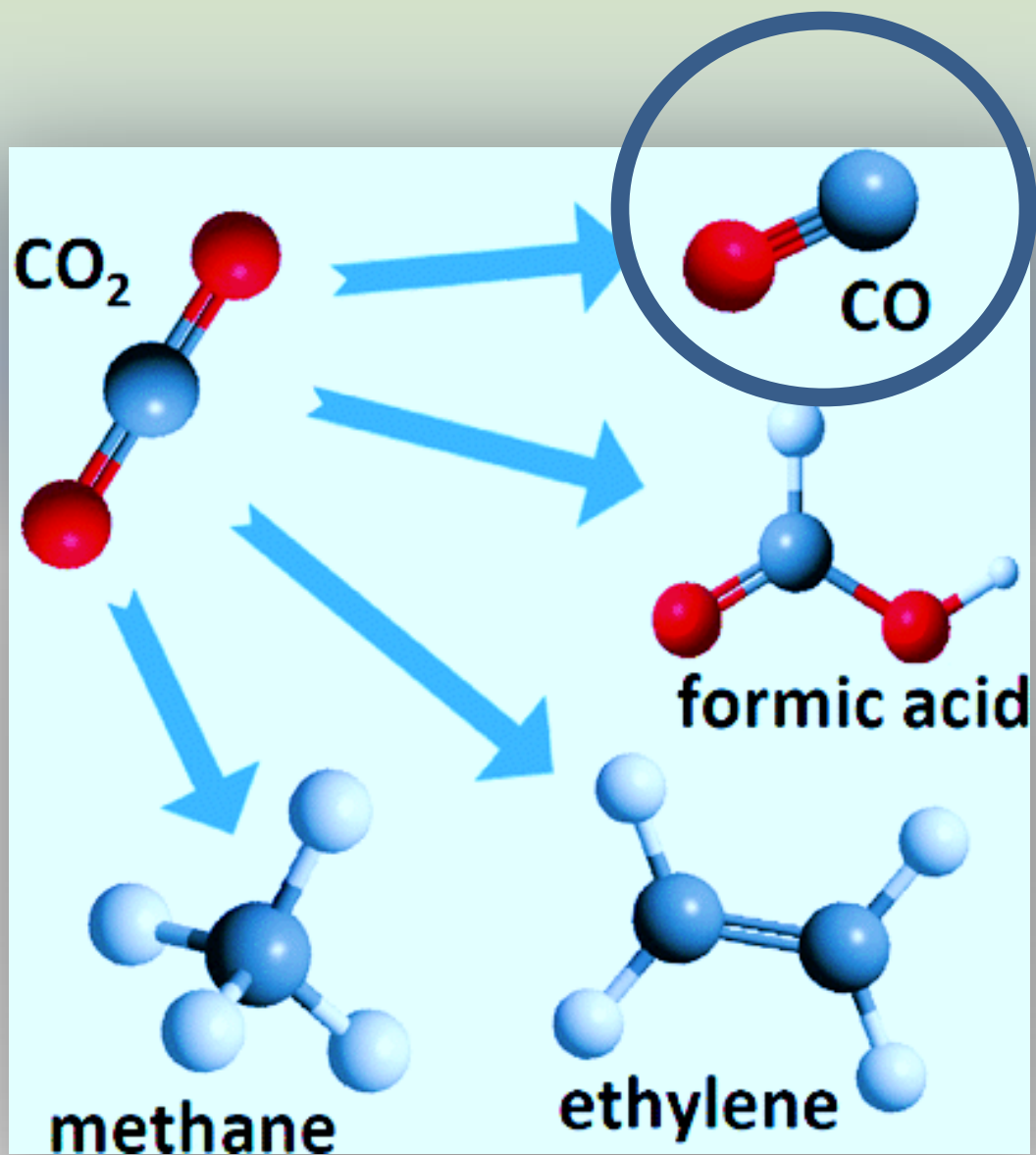
EXPLORING CO₂ as a Feedstock



CO₂ Projects with Industrial Significance for CTL

ADVANCED CATALYST DEVELOPMENTS





S/Hg/

CATALYST



Gasification



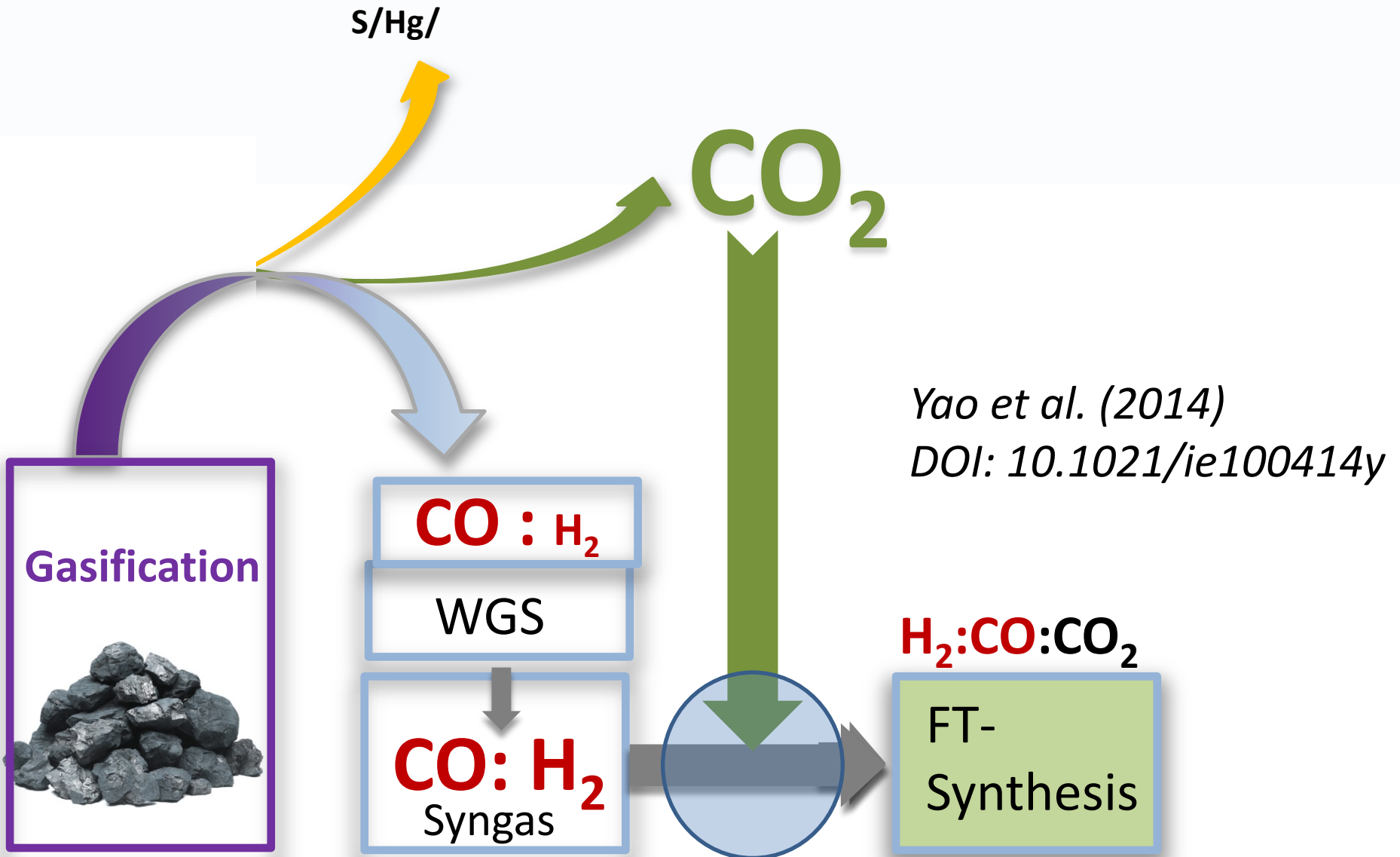
CO : H₂

WGS

CO : H₂
Syngas

FT-
Synthesis

CO₂ Recycle “reuse”



STRATEGY

Recycle “reuse”

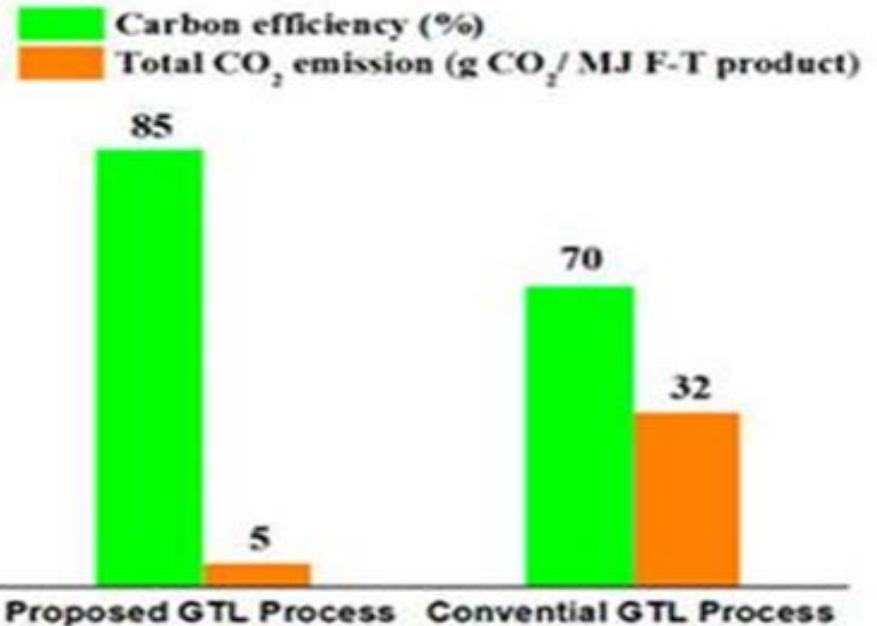


Fischer-Tropsch Synthesis
Fe catalyst

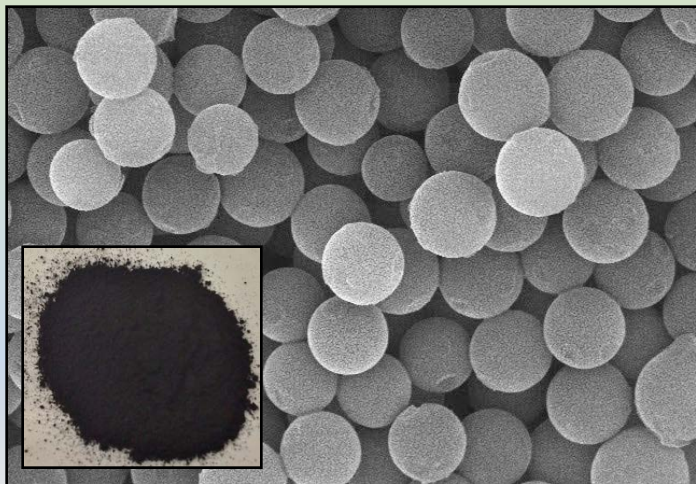


**CO₂ recycling to
improve XTL efficiency
and reduce total CO₂
emissions.**

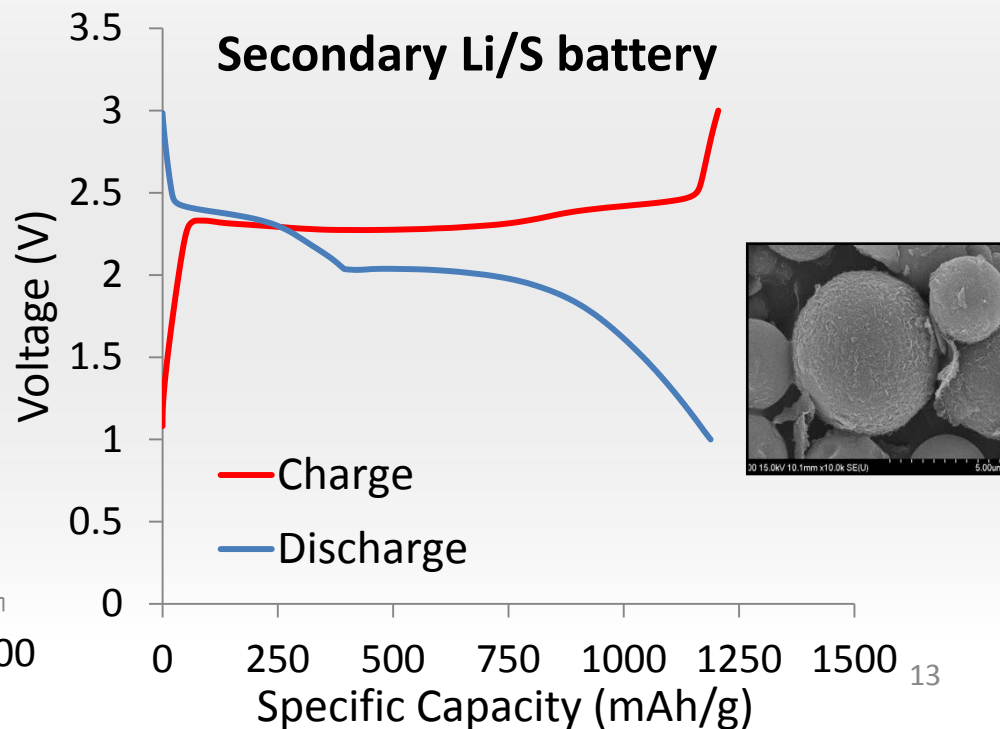
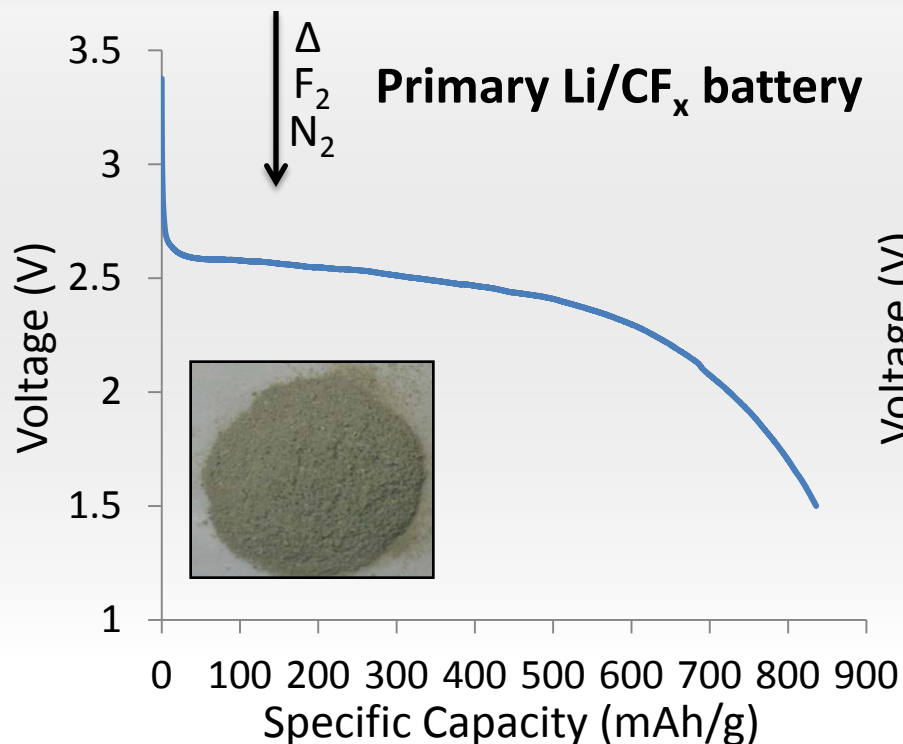
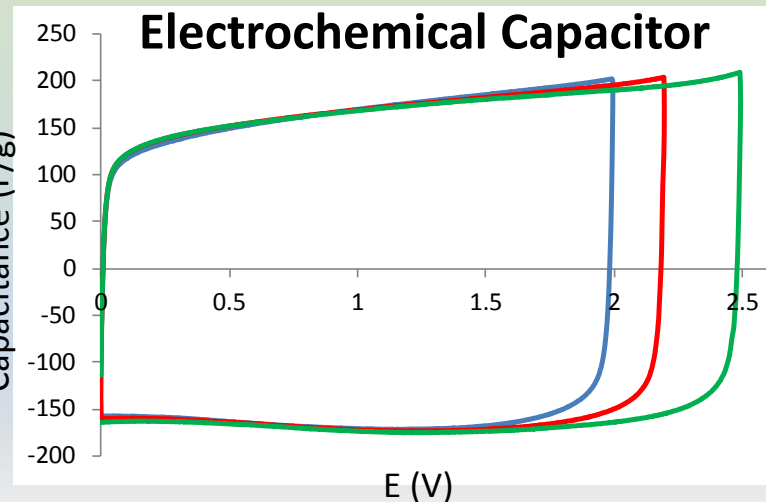
Zhang et al. (2014) *Environmental Science & Technology* doi: [10.1021/es501021u](https://doi.org/10.1021/es501021u)



CO₂ used in carbon Formation for Electrochemical Energy Storage

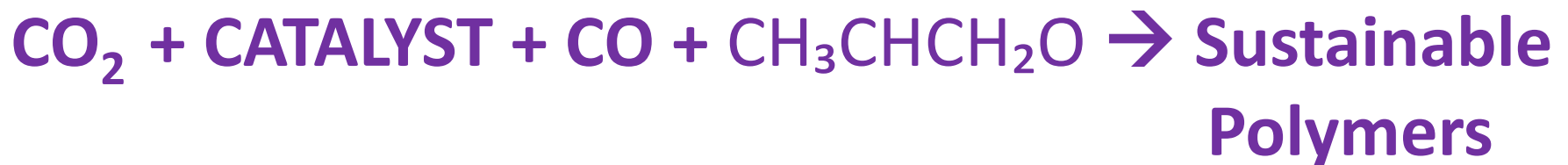


Δ
ACTIVATION



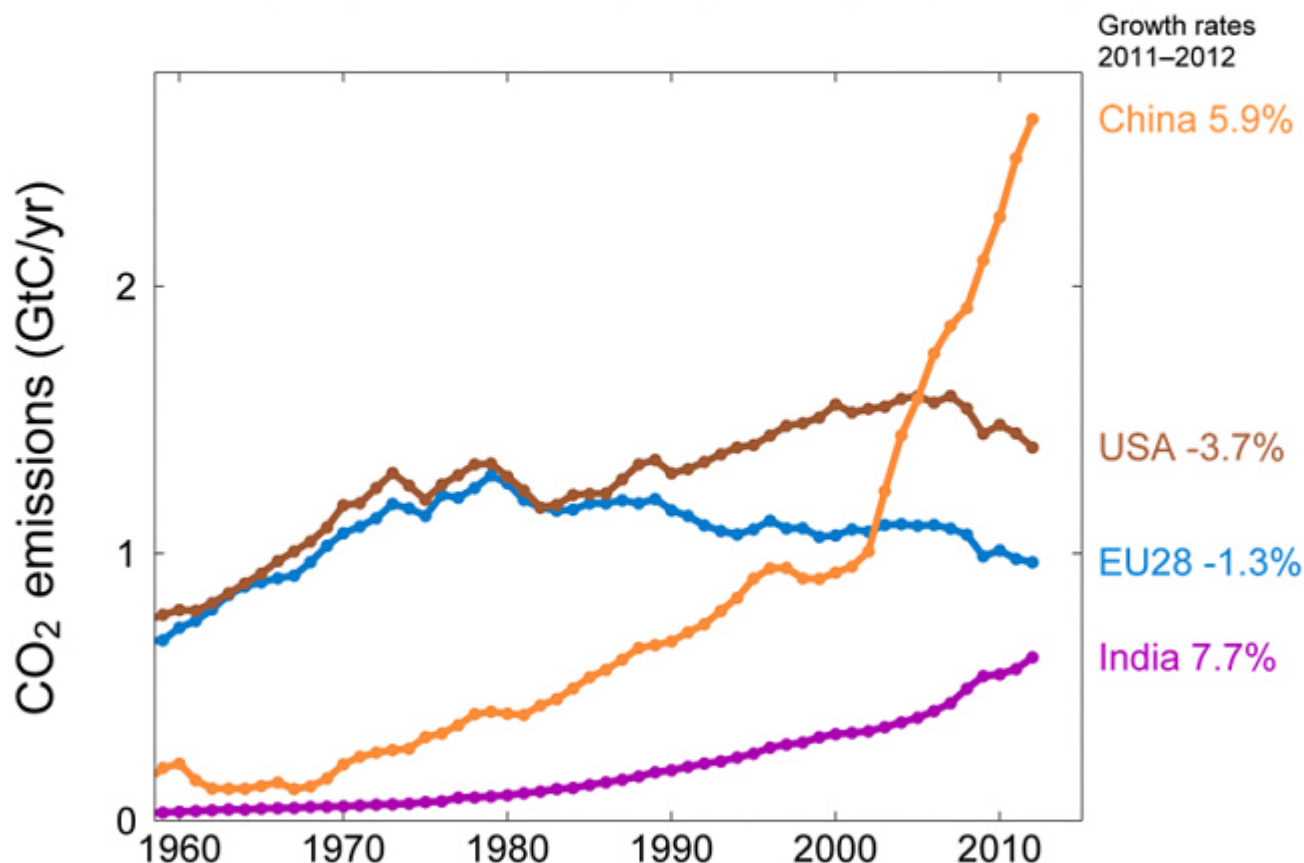
STRATEGY

**Companies that are in the process of
converting CO₂**



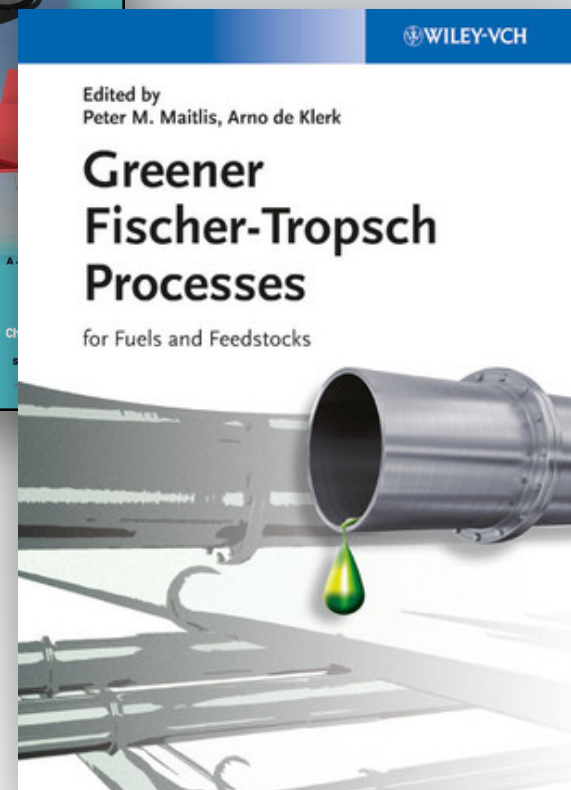
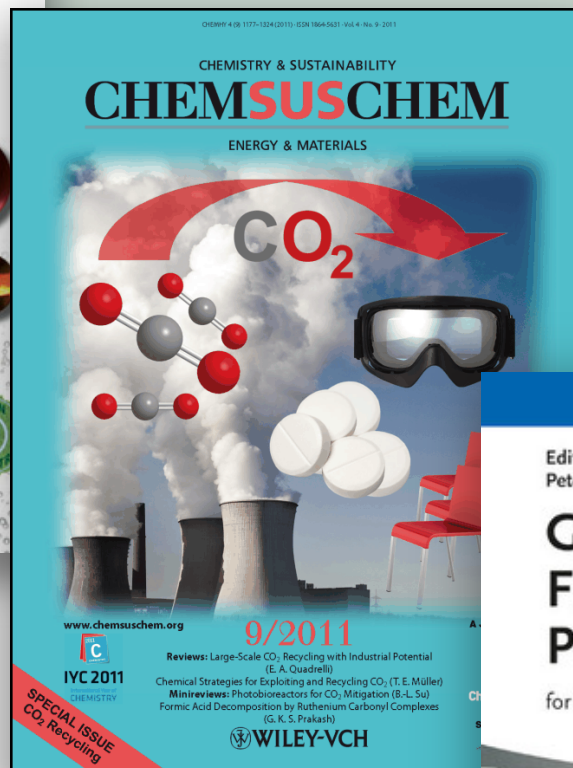
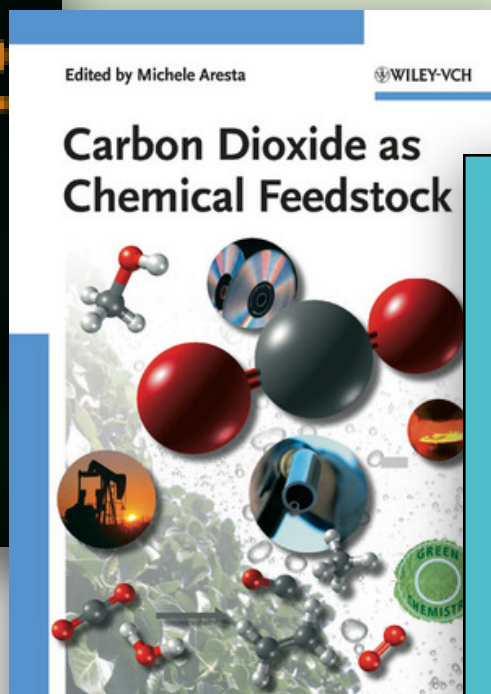
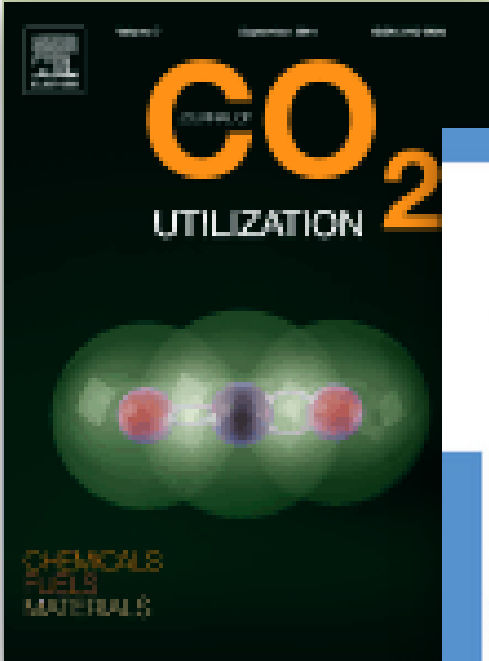
Top Fossil Fuel Emitters (Absolute)

Top four emitters in 2012 covered 58% of global emissions
China (27%), United States (14%), EU28 (10%), India (6%)



With leap year adjustment in 2012 growth rates are: China 5.6%, USA -4.0%, EU -1.6%, India 7.4%.

Source: [CDIAC Data](#); [Le Quéré et al 2013](#); [Global Carbon Project 2013](#)





Strategy for Coal-to-Liquids

Future Outlook?



Technological advances have created many new opportunities for CTL and other sectors to treat CO₂ as a value added resource.



Arthur C. Clarke predicting the future in 1964

THANK YOU

to the Organizers of the

West Virginia 2014 Energy Summit

