





#### Didactic Material of the ProQR Alternative Fuels for Aviation in Brazil

#### Claudio J. A. Mota

Federal University of Rio de Janeiro – Institute of Chemistry, Brazil Federal University of Rio de Janeiro – School of Chemistry, Brazil INCT Energy & Environment, UFRJ, Brazil



Laboratory of Hydrocarbon Reactivity, Biomass and Catalysis Chemistry Institute - UFRJ



#### **Chemistry and Fuels**







#### CO<sub>2</sub> in the Atmosphere







## **Carbon Cycles**









# **Didactic Material**

- 0. Introduction on ProQR Project and Global Context
- 1. Brazil Infrastructure & Future energy strategies
- 2. Renewable Energy Potential
- 3. Feedstocks for PtL (Water / CO<sub>2</sub>)
- 4. Electrolysis & Syngas production)
- 5. Synthesis
- 6. Post-Processing (Refinery)
- 7. Certification
- 8. EPC Engeneering, Procurement, Construction
- 9. Operation, Maintenance, End of Life
- 10. Products
- 11. Energy Planning





# Didactic Material $\Leftrightarrow$ Feedstock

- Synthetic fuel production
- Electrical energy sources
- Biomass
- Sustainability
- Carbon
- Carbon via CO<sub>2</sub>
- Reverse Water Gas Shift
- Water



#### **Synthetic Aviation Fuel - SAF**





## **Brazil's Scenarios for ProQR**

#### **Electricity**



Hydropower







Wind



**Bioelectricity - bagasse** 



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## **Brazil's Scenarios for ProQR**

#### Biomass ⇔ BTL (syngas)



#### Sugar cane

Corn



- Soybean
- Vegetable oils
- Tallow

**Agriculture wastes** 









# **Brazil's Scenarios for ProQR**

**Carbon**  $\Leftrightarrow$  **CO**<sub>2</sub>

- ➤ From industrial sources ⇔ flue gas;
- ➢ From the atmosphere ⇔ DAC;
- From biogas ⇔ anaerobic fermentation (garbage);
- ➤ From sugar fermentation ⇔ ethanol;









## **Brazil's Scenarios for ProQR**



13% of the non-salted water of the world



Water  $\Leftrightarrow$  H<sub>2</sub>

Surface water;
Ground water;
Sea water;



✓ Water electrolysis;

 ✓ Water splitting ⇔ photoelectrocatalysis and photocatalysis

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# **Final Remarks**

- The development of aviation fuel of low environmental impact is within the goals of the government program named Fuels of the Future (Combustível do Futuro);
- ProQR didactic material emcompasses all the aspects related with technologies and issues for the production of low-environmental impact aviation fuel;
- □ The didactic material will serve as reference for graduate and undergraduate courses in Brazilian universities;
- □ Brazilian specificities ⇔ solar energy; biomass





## **Education for Sustainability**



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