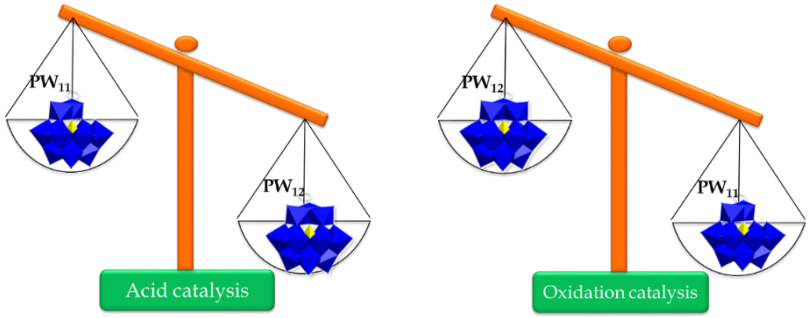
Main Conclusions

- We have successfully *synthesized* and *characterized* environmentally benign bifunctional catalysts comprising of parent and lacunary phosphotungstate anchored to *MCM-41* and *MCM-48*.
- Three different types of reaction namely *acid* catalyzed, *oxidation* and *one pot oxidative esterification* reactions were studied under mild conditions.
- Based on *scale up* experiments, industrial biodiesel production process was proposed over different feedstocks.
- Overall *economic* and *environmatal benefits* were accomplished as glycerol, a byproduct of biodiesel, has been utilized to give value added products.
- For all the acid catalyzed transformations the activities of PW_{12} based catalysts were *higher* than PW_{11}.



- For all the oxidation reactions PW_{11} proved to be *better active sepcies* as compared to parent PW_{12}, in addition O_2 comes out to be a *better oxidant* than H_2O_2.
- Based on catalytic and kinetic studies: MCM-48 proved to be a *better support* as compared to MCM-41.