The previous research from Dr. Lane’s group shows that water pretreatment (to reduce the catalyst under the environment with water vapor in the final catalyst preparation step) on Pt/γ-Al₂O₃ catalyst can decrease CO preferential oxidation reaction temperature by around 100 ℃. This behavior is extremely helpful for saving energy on maintaining chemical reactions. In our current research, we are trying to repeat that phenomenon in a CH₄ partial oxidation reaction with the same catalyst pretreatment method. We prepared Rh/γ-Al₂O₃ catalyst with water pretreatment, and applied it to a CH₄ partial oxidation reaction, aiming to decrease reaction temperature. We also prepared the same kind of catalyst without water pretreatment for that reaction. By comparison, the effect of water pretreatment on decreasing reaction temperature is further presented. TEM and XRD are applied to research microstructure of the two catalysts, and catalytic behavior can be partially explained by catalyst microstructure.