In this study, ZrO$_2$ nanoparticles were synthesized by hybrid route hydrothermal process, using zirconium butoxide as precursor [2]. We performed two case studies. Initially, the samples were synthesized at temperatures of 100 °C, 150 °C and 200 °C without pH range. In the second stage, the temperature was set to 200 °C and the synthesis occurred at pH 1 and 10. The samples were characterized by XRD, FT-Raman spectroscopy, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) and Analysis of Surface Area (BET). The results indicate that the effect of temperature influence on crystal growth and particle size. All samples showed a tetragonal phase with exception for sample synthesized at pH 1 which also showed a monoclinic phase. The study of adsorption isotherm was analyzed by adsorption of Rhodamine B (RhB). The concentration of the Rhodamine B after adsorption was analyzed by spectrophotometry using the Beer Lambert Law. The results showed that the adsorption in all samples gave hydrothermal synthesis and formation of particles in the range 2-7 nm and also the formation of structures with large surface area of up to 511.63 m$^2$/g. It was concluded that the particle size is attributed to the temperature variation during synthesis [1] and all samples showed the ability to promote the chemical adsorption of Rhodamine B on the surface of ZrO$_2$.

References:
