Size-effects on the Raman spectra of anatase nanoparticles is an interesting topic in characterization of nanomaterials. Previous studies have focused only in the size-effects on the phonon frequency and the broadening of the lowest-frequency $E_g$ mode. It was demonstrated that the blueshift and broadening of low-frequency $E_g$ mode ($143$ cm$^{-1}$) observed in anatase TiO$_2$-anatase has a tetragonal crystal structure of space group $D_{4h}^{19}$ with two formulas per unit cell and thus has six Raman active modes ($A_{1g} + 2B_{1g} + 3E_g$) [1]; however, a detailed discussion about the shift and broadening of all active modes of rutile and anatase is no reported in the literature. Similarly, there are few reports of analysis of all modes of vibration of the rutile phase. In this work we investigate the all Raman bands of anatase and rutile and its dependence with the particle size (4-20 nm). The materials were synthesized by microwave hydrothermal assisted method. Both, peak broadening and blue-shifts of the Raman bands with decreasing particle size were observed for the three lowest Raman active modes. In contrast, for the highest frequency $A_{1g} + B_{1g}$ and $E_g$ modes, there is not significant dependence with the size. The results are discussed in terms of the structural characterization by means of Rietveld analysis, including cell parameters and strain.

**Keywords:** Anatase- TiO$_2$, Raman shift, Rietveld

**References:**


**Presenting author's email:** mara_mccc@hotmail.com