“Clay surface changes after chemical and physical treatments”

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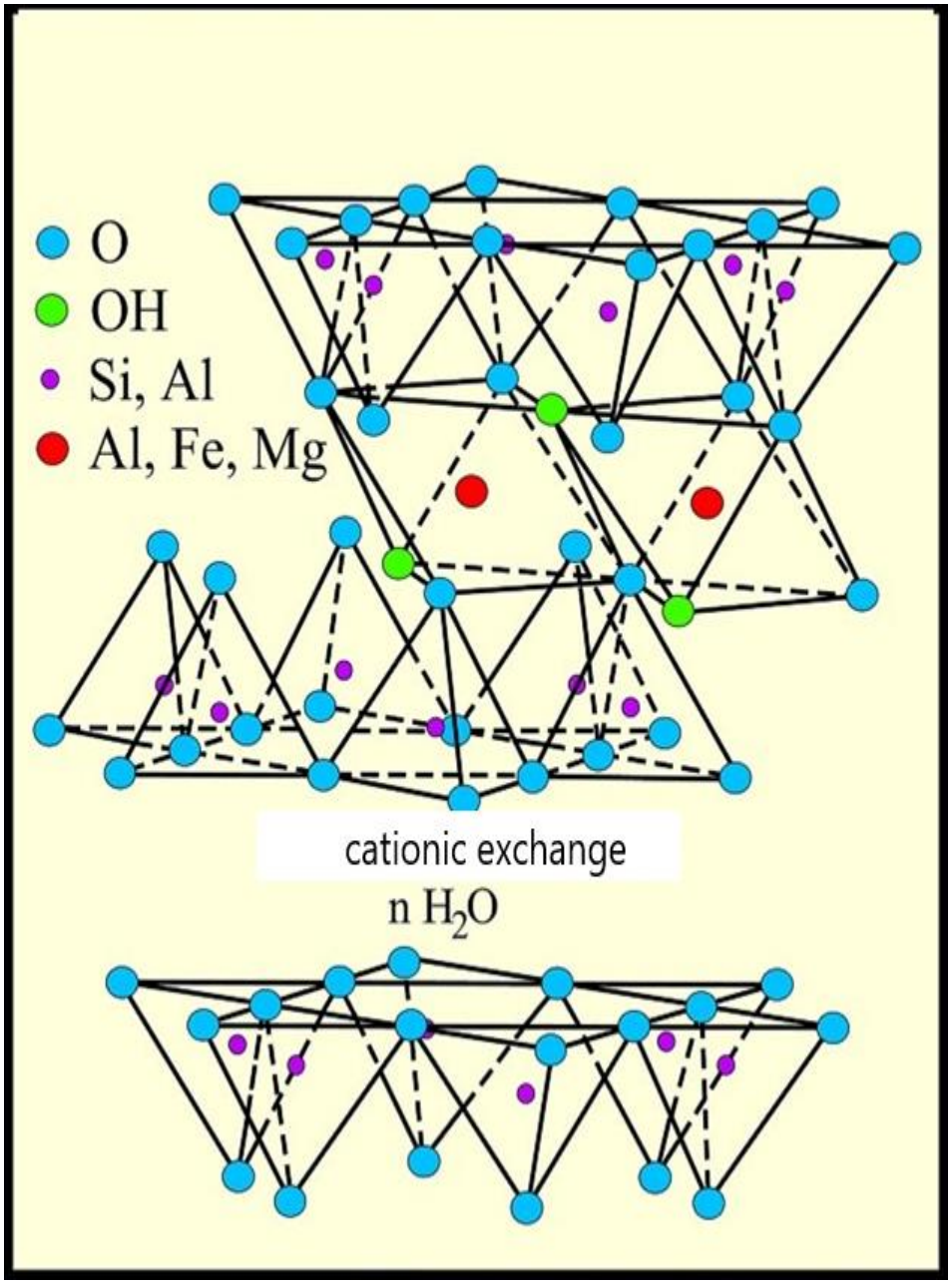


Smectic Structure

Objectives

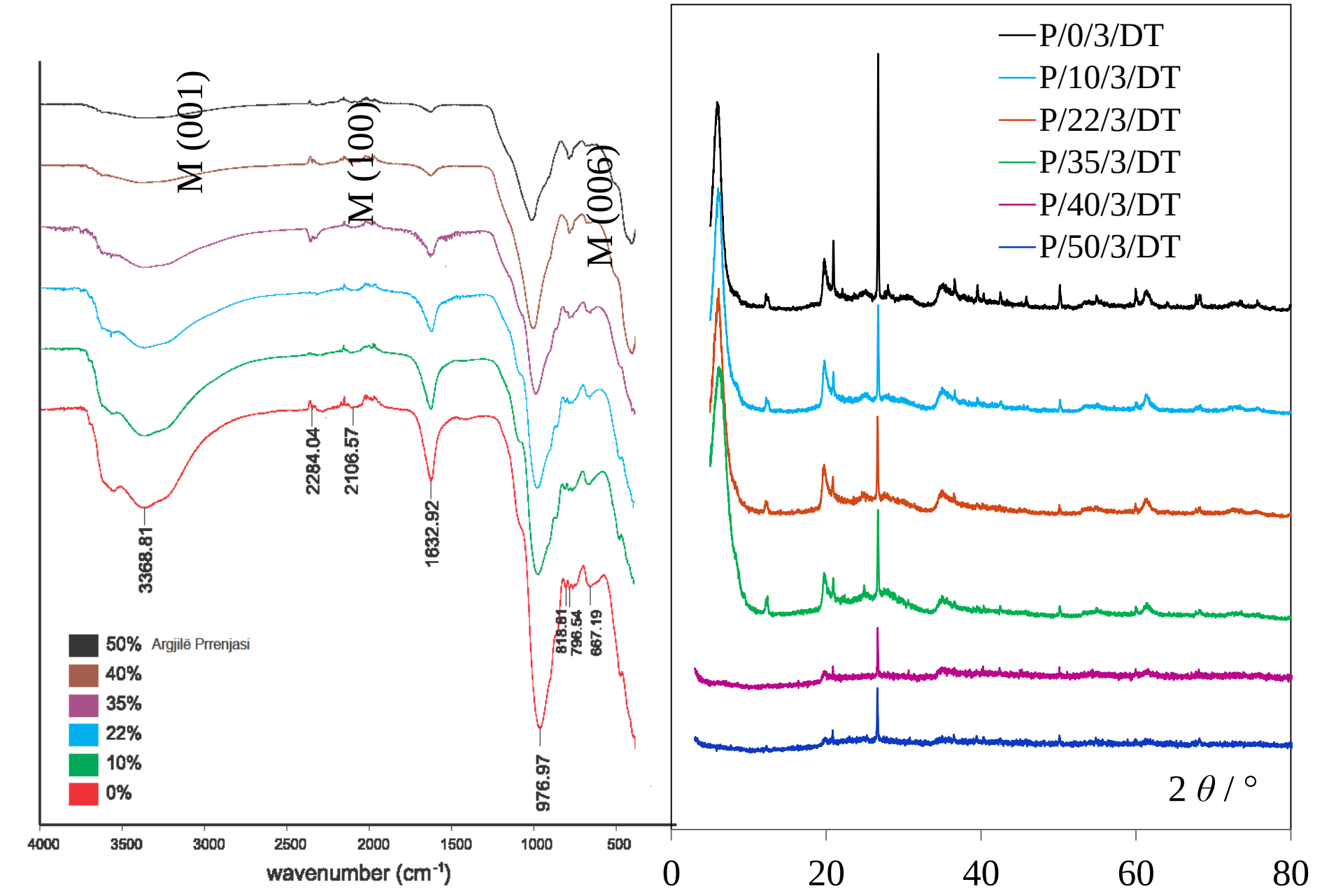
- Acid activation with H_2SO_4 clay mineral in concentrations 10%, 22%, 35%, 40% and 50% calculated against the clay mineral dry mass.
- Determination of changes in the crystallinity, chemical composition and CEC, by IR, X-Ray Diffraction, wet chemistry analysis and BM method.
- Determination of changes in the specific surface area and porosity by N_2 adsorption on the clay mineral at 77 K.
- Determination of surface changes in mineral clay after thermal treatment at 120^0C, 160^0C, 180^0C and 250^0C, for 4, 9 and 15 hours.

Results

Changes in the chemical composition of mineral clay during the sulphuric acid activation in different concentrations

Clay	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	CaO %	MgO %	SO_3 %	r SiO_2/MxOy
untreated	47.05	13.4	14.97	2.7	9.58	0.11	1.239
H_2SO_4 10%	47.49	12.52	15.53	0.85	7.83	0.15	1.323
H_2SO_4 22%	49.15	9.55	16.04	0.96	7.12	0.23	1.502
H_2SO_4 35%	51.74	9.31	14.16	0.89	6.10	1.15	1.901
H_2SO_4 40%	59.26	6.95	10.11	0.55	4.97	0.12	2.429
H_2SO_4 50%	65.54	6.82	5.32	1.10	3.95	0.35	4.073

IR spectra and X-Ray Diffractograms of clay treated with H_2SO_4 in different concentrations



Conclusions

During H_2SO_4 activation of clay mineral happens:

1. Leaching of cations Mg^{2+}, Ca^{+2}, Al^{3+}, Fe^{3+}, from the interlayer space and the octahedral sheet. (IR and chemical analysis). Complete removal of the bonded water from the structure.
2. Montmorillonite aggregates become smaller and their crystallinity is reduced until complete exfoliation for acid concentration used of H_2SO_4 40% and 50%. The reason is the solubilisation of the octahedral sheet (d_{001} peak disappears).
3. SSA increases from 83 m^2/g to 420 m^2/g and the pore volume from 69cm^3/kg to 384 cm^3/kg. Mainly increases the pore in size of 2 – 6 nm.
4. Thermal activation of the natural clay increases very much the pore volume but not the SSA because of the water removal from the structure.

THANK YOU !