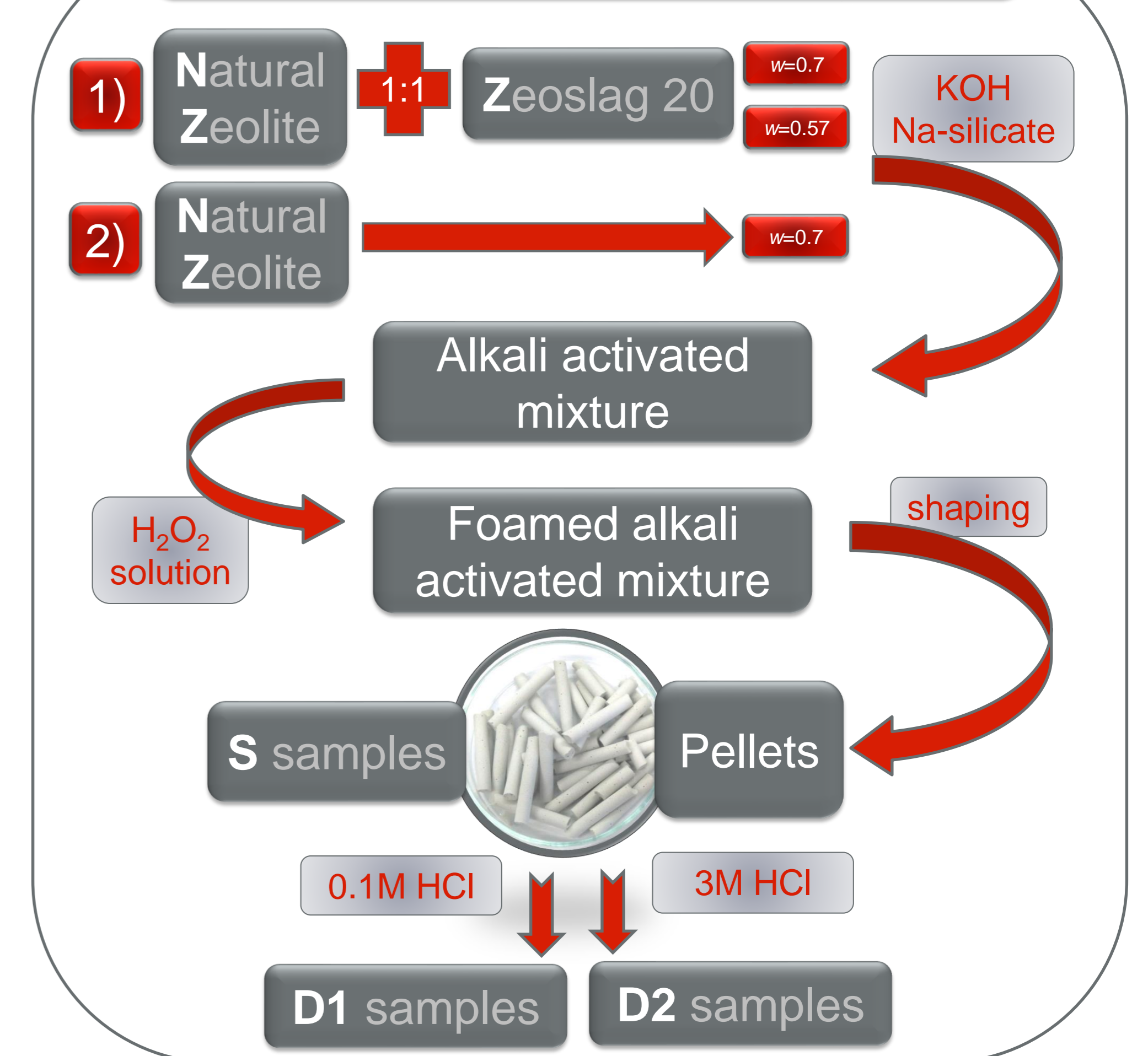


Ing. Kateřina Strejcová, Ing. Zdeněk Tišler, Ph.D., Bc. Eliška Svobodová
 ORLEN UniCRE a.s., Areál Chempark 2838, Záluží 1 Litvínov, Czech Republic.
 Contact: Katerina.Strejцова@unicre.cz

INTRODUCTION

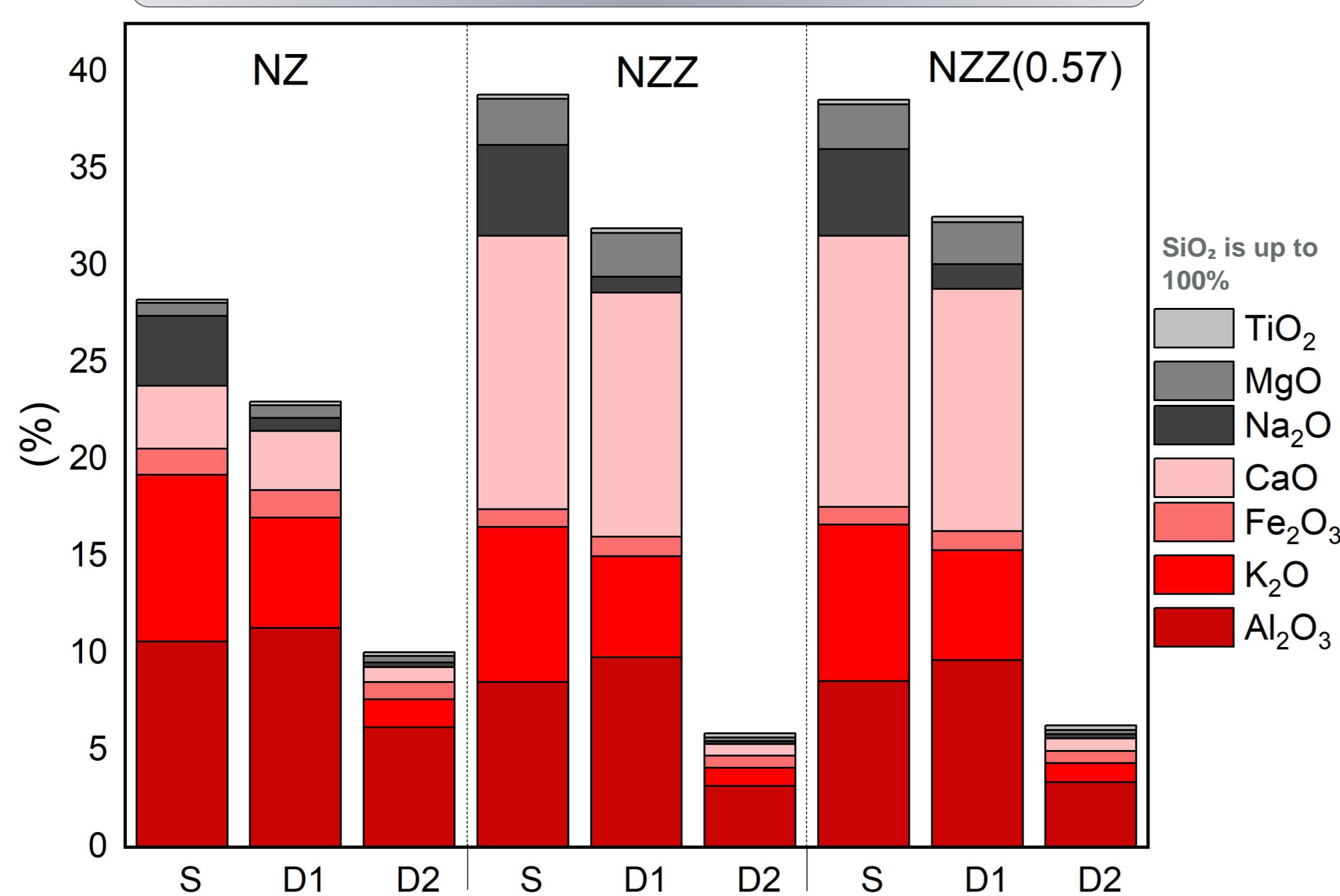
This study focuses on the natural zeolite (NZ) and the mixture of the NZ and commercial material Zeoslag 20 (NZZ), which is a mixture of a blast furnace slag and natural zeolite. Natural zeolites have a unique porous structure and are mainly used in the building industry, and for water purification. The modification of its chemical, textural and mechanical properties makes this material usable in other industries, especially in the chemical industry. This study aimed to examine the influence of the addition of blast furnace slag to alkali-activated mixtures based on natural zeolites and observe the effect of subsequent leaching on the properties of these materials. The modification of NZ and NZZ samples (S samples) was carried out by the leaching using 0.1M HCl (D1 samples) and then using 3M HCl (D2 samples). This treatment could be an effective tool to modify the structure and composition of these materials. Properties of these materials were determined using N₂ physisorption, Hg porosimetry, XRF, XRD, DRIFT, and strength measurements.

EXPERIMENTAL



RESULTS

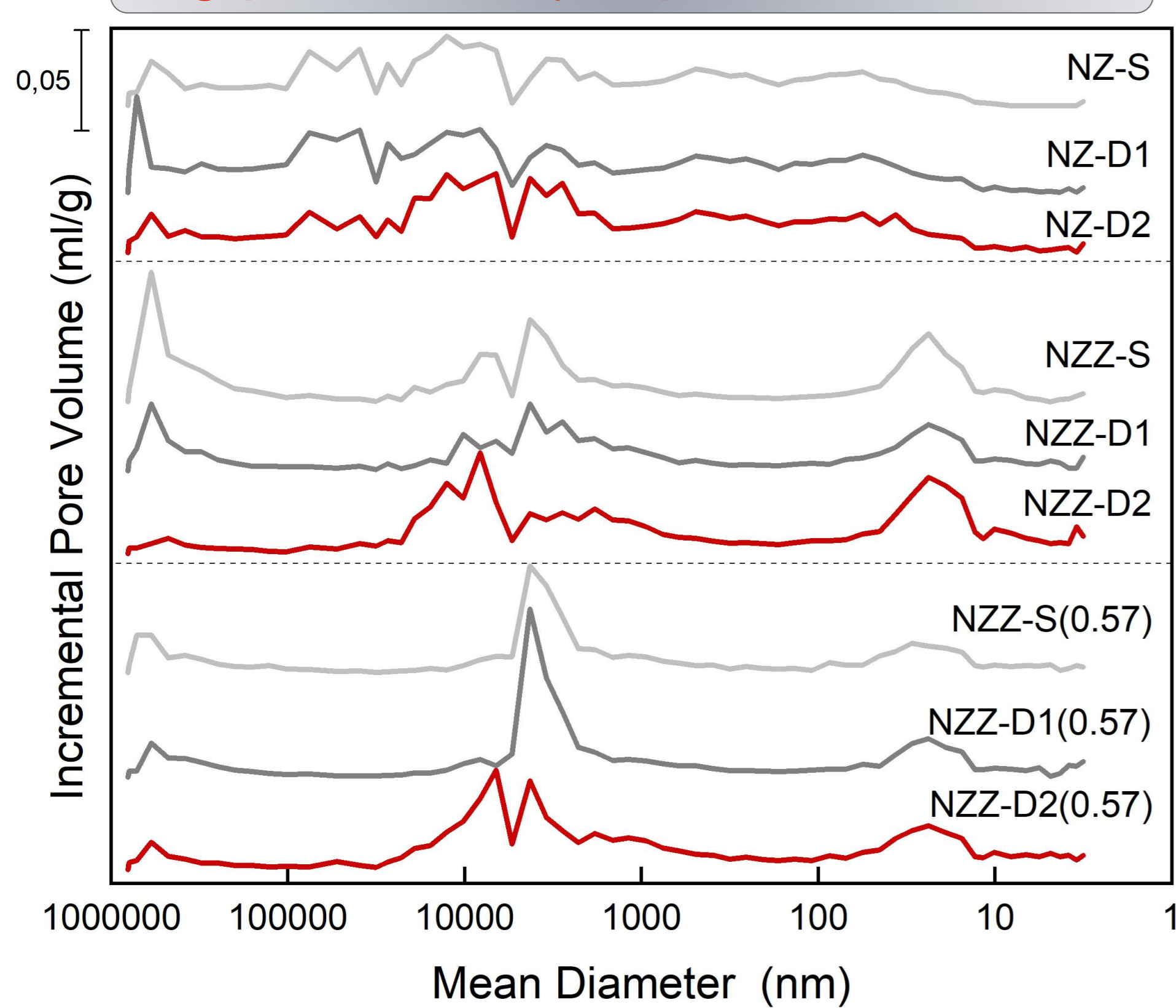
Chemical composition



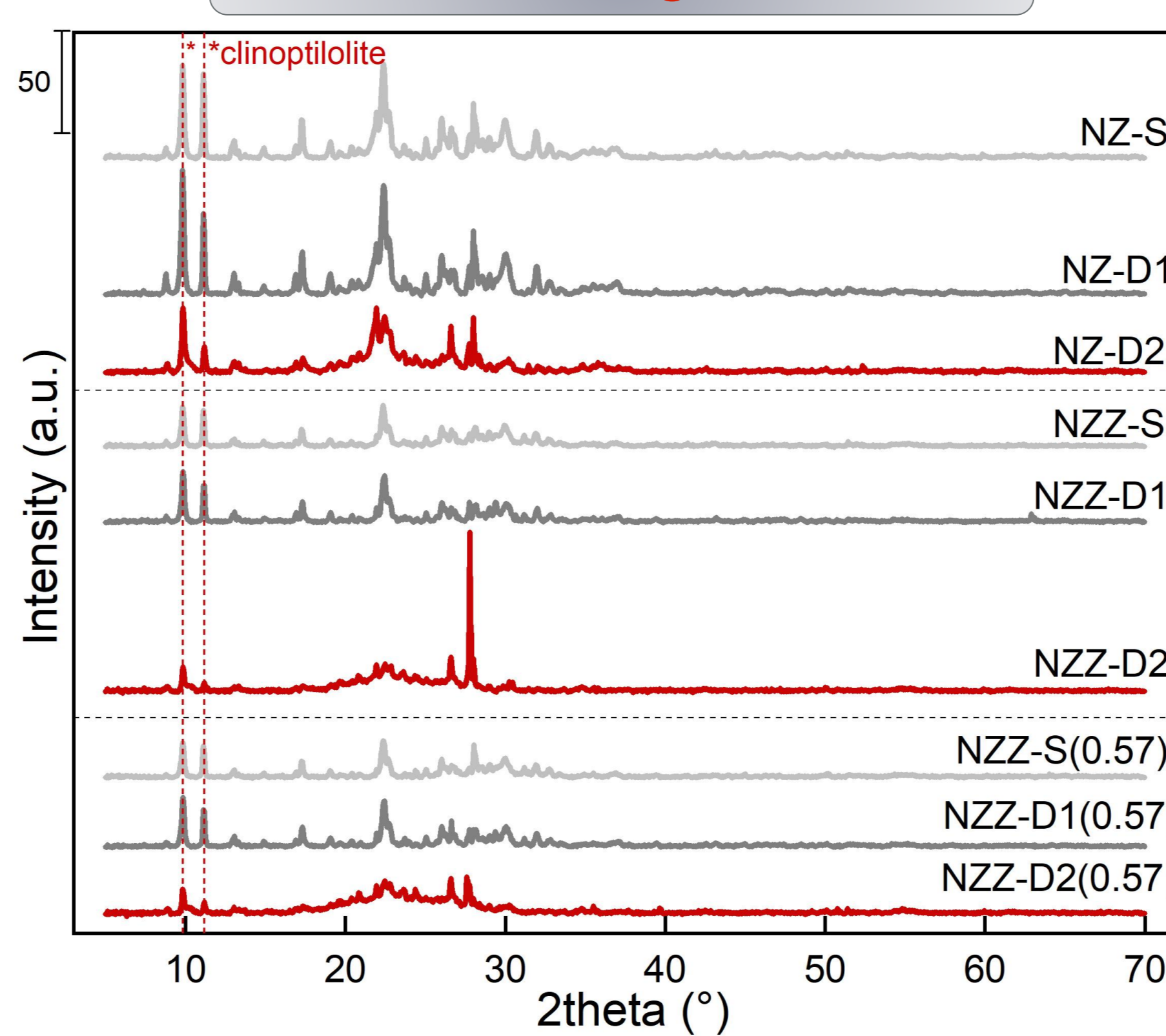
Textural properties

Sample	Water coefficient w	ρ (g/cm ³)	Strength (N)	BET [m ² /g]	Total Intrusion Volume [cm ³ /g]
NZ-S	0.7	0.8882	19.6	12.4	0.763
NZ-D1	0.7	0.7665	/	35.9	0.873
NZ-D2	0.7	0.6505	10.5	117.4	0.881
NZZ-S	0.7	1.0679	42.9	33.5	0.616
NZZ-D1	0.7	0.8422	43.9	108.4	0.513
NZZ-D2	0.7	0.6764	12.3	221.1	0.729
NZZ-S(0.57)	0.57	1.2147	64.6	23.9	0.431
NZZ-D1(0.57)	0.57	1.0109	52.0	87.1	0.512
NZZ-D2(0.57)	0.57	0.6904	14.8	236.4	0.664

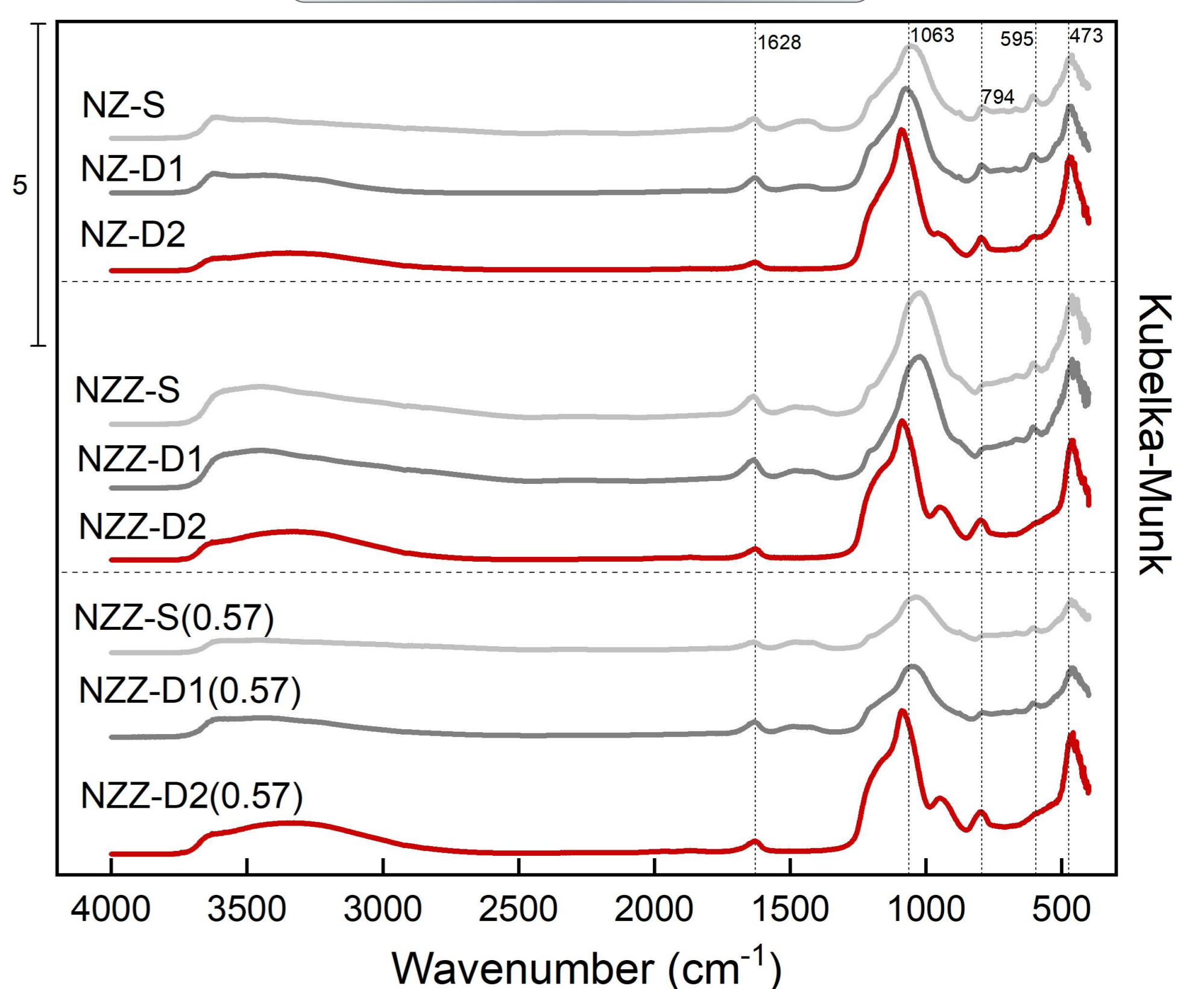
Hg porosimetry – pore distribution



Diffractograms



DRIFT spectra



CONCLUSION

The results showed that the addition of blast furnace slag in the form of Zeoslag material significantly increased the strength of the obtained materials. It increased twice, and when using a lower water coefficient w up to three times. This increase was due to the presence of the C-S-H phase, which is denser (increase in density and decrease in the total intrusion volume of the samples), and which complements the binder N(K)-A-S-H phase resulting from alkaline activation of NZ. The addition of Zeoslag significantly affected the textural properties, especially in D2 leached samples where there was a twofold increase in BET while maintaining the same strength as the NZ sample. The addition of Zeoslag also affected the pore distribution. The presence of Zeoslag generated a higher proportion of mesopores, which are attributed to the presence of the C-S-H phase and are easily removed by leaching, as shown by the XRF results. The addition of slag caused a decrease in the crystallinity of the samples. The decrease was probably due to amorphization, i.e., by the better dissolution of the particles into the binder matrix. The slight increase in crystallinity of the D1 samples is then due to the "purification" of samples. However, leaching using 3M HCl led to a significant decrease due to the attack on zeolite structures. The obtained data showed an improvement in properties and extension of the potential applicability of these materials in the chemical industry, especially for catalytic and sorption applications.