

# Supplementary Materials: Combined Influence of Low-Grade Metakaolins and Natural Zeolite on Compressive Strength and Heavy Metal Adsorption of Geopolymers

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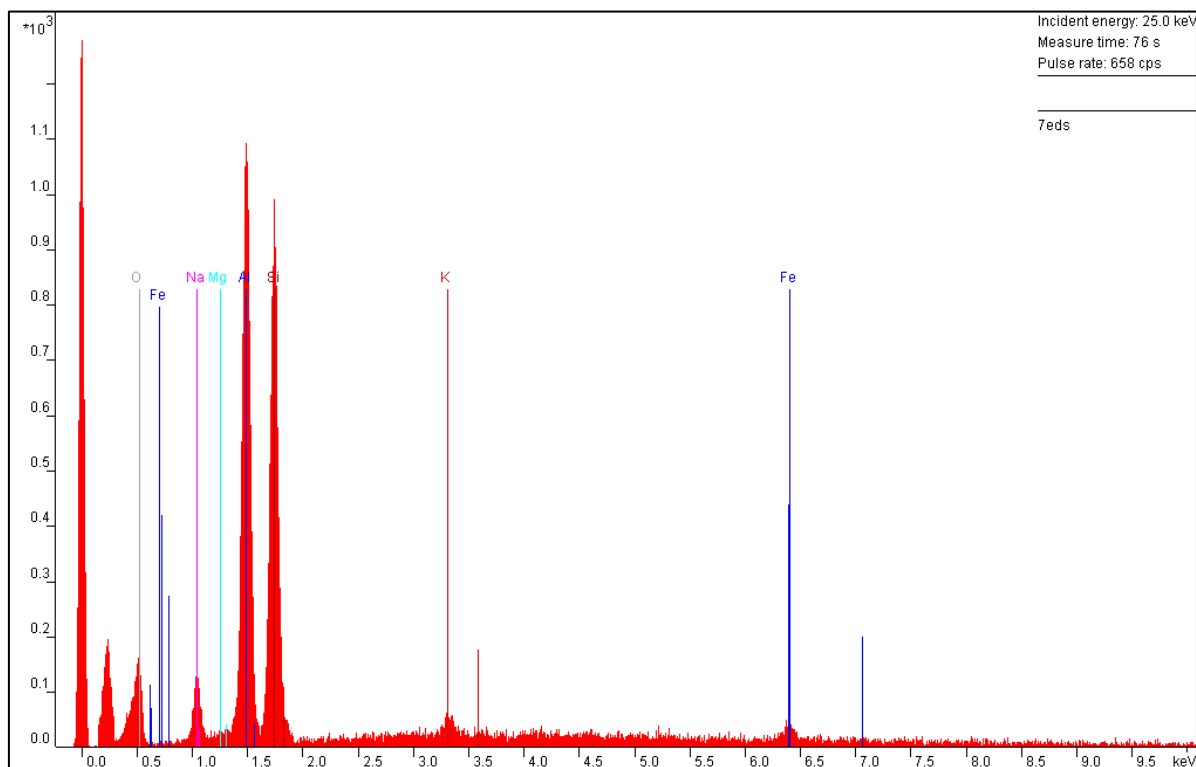


Figure S1. EDS analysis of particle x in Figure 6b.

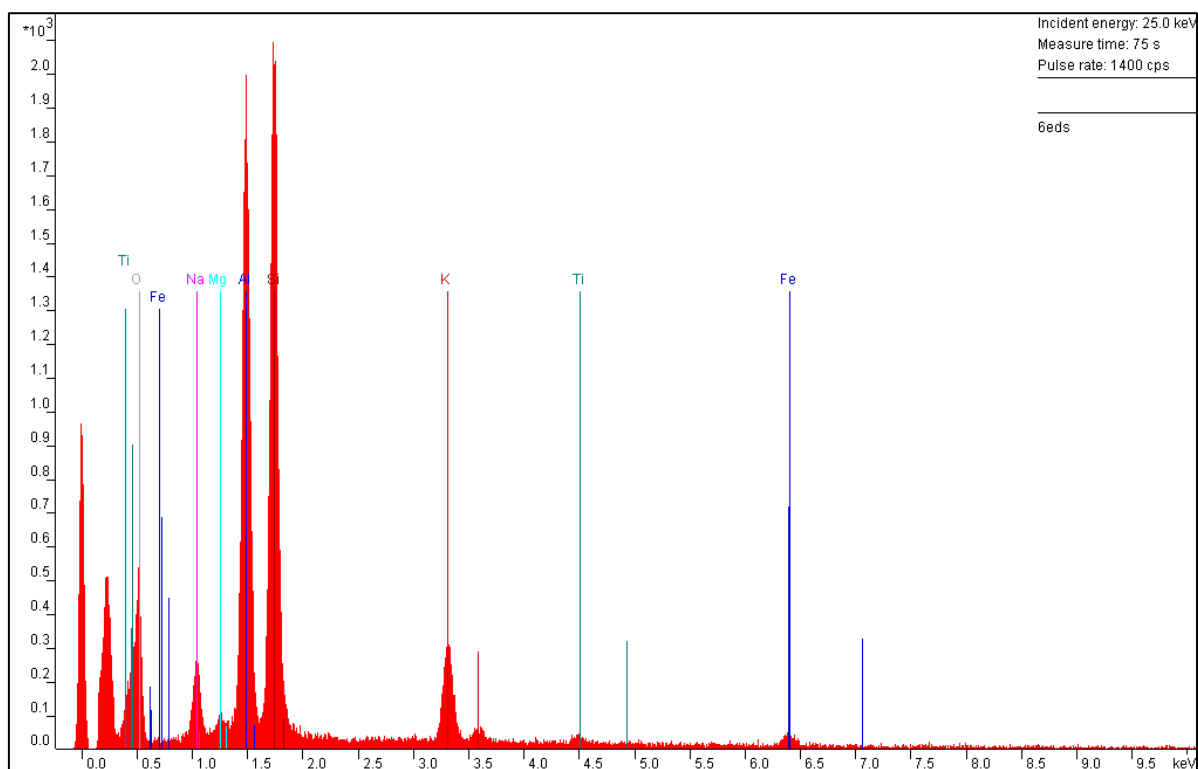


Figure S2. EDS analysis of particle y in Figure 6b.

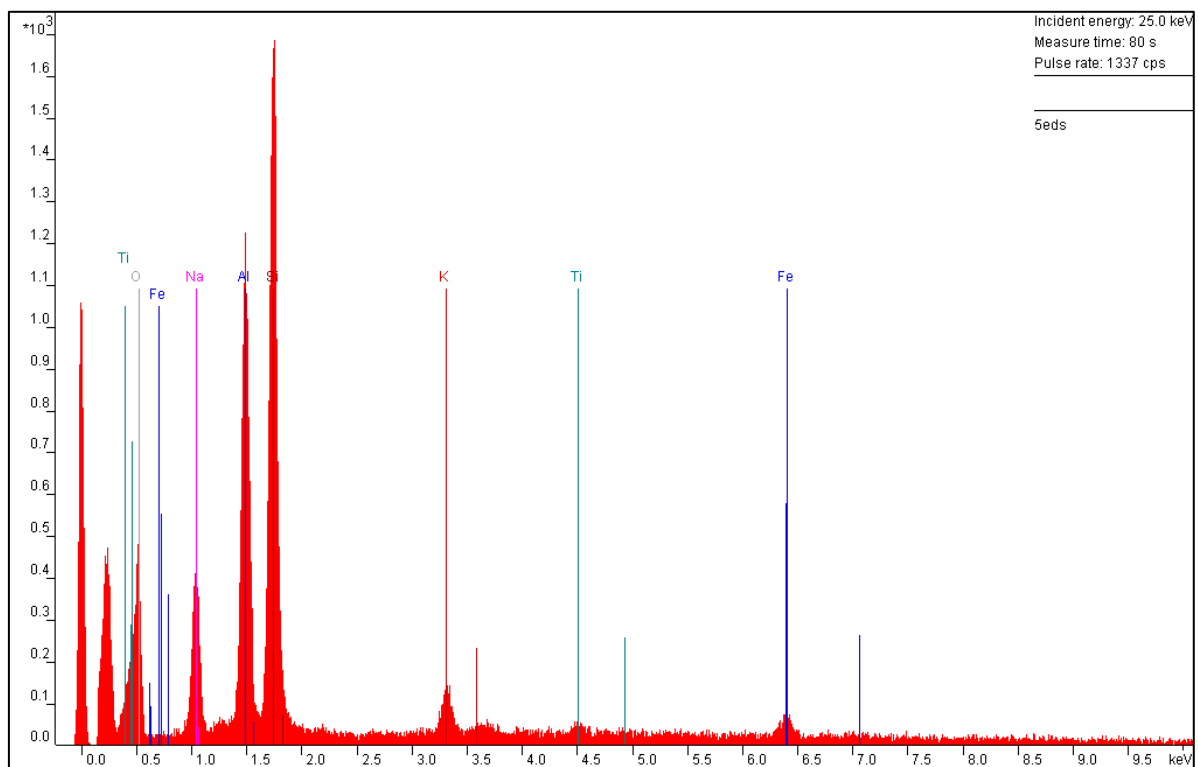


Figure S3. EDS analysis of particle x in Figure 6c.

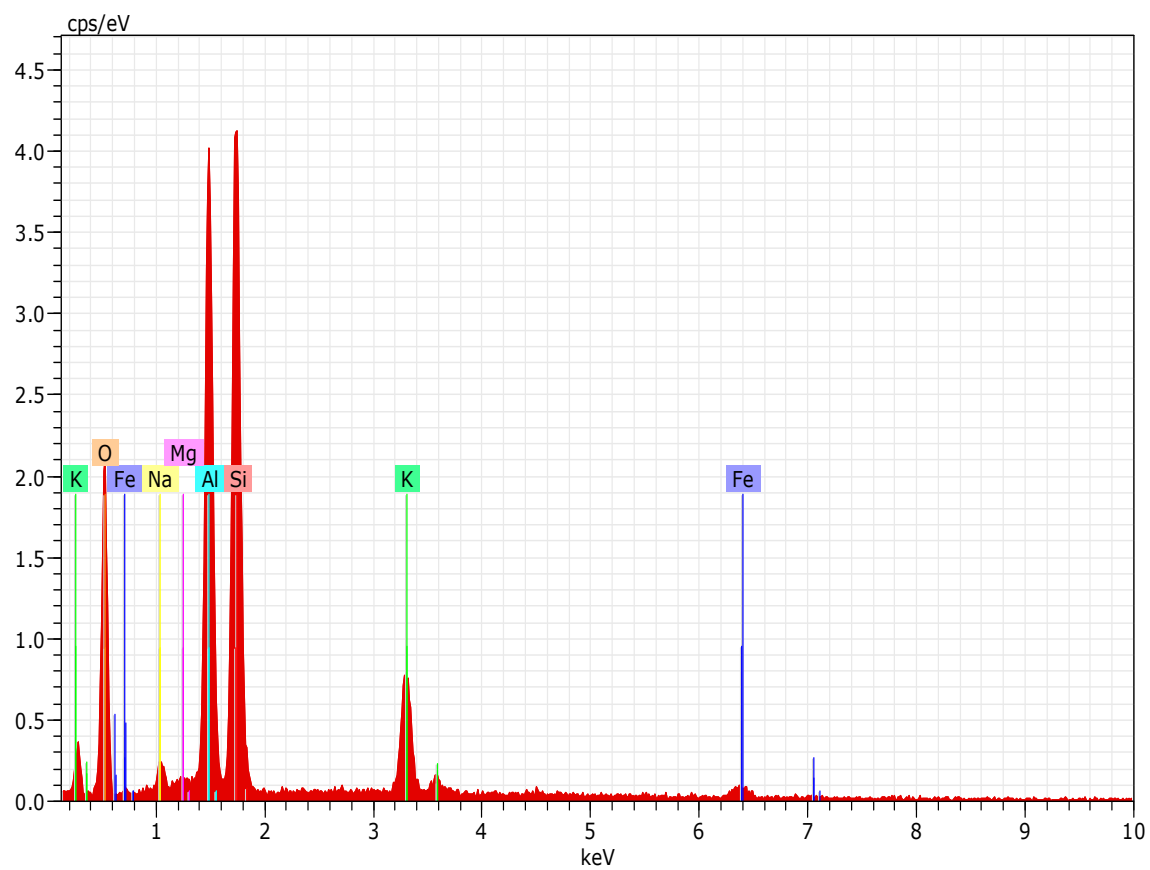


Figure S4. EDS analysis of particle x in Figure 7b.

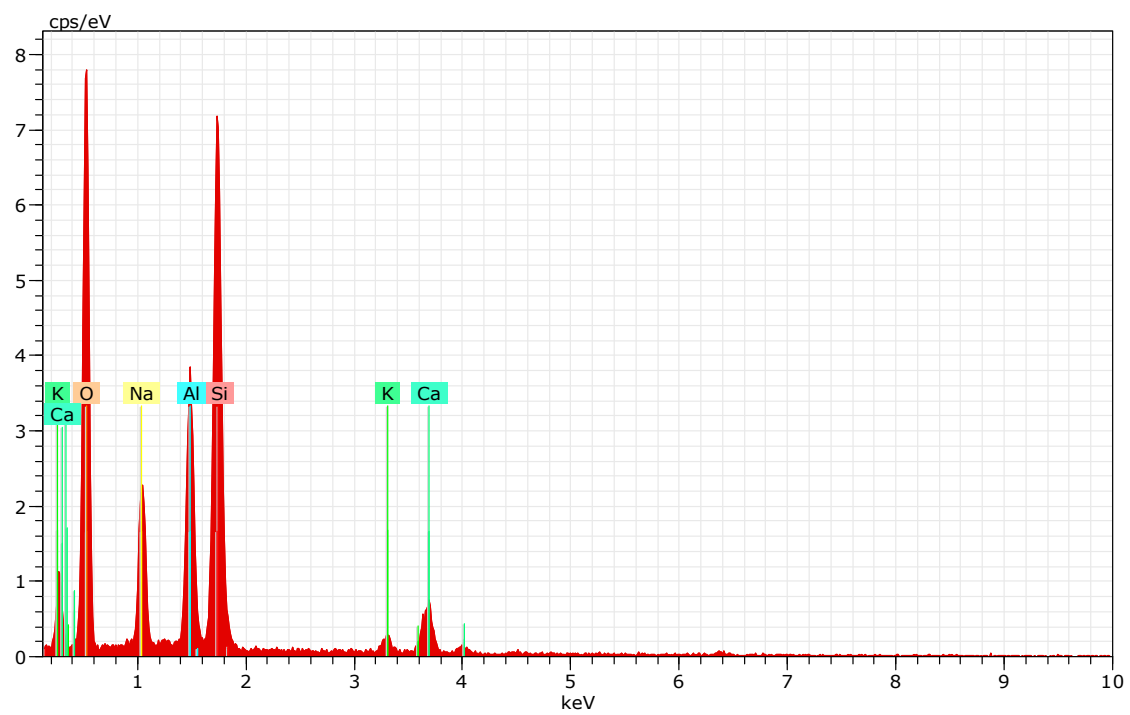


Figure S5. EDS analysis of particle y in Figure 7b.

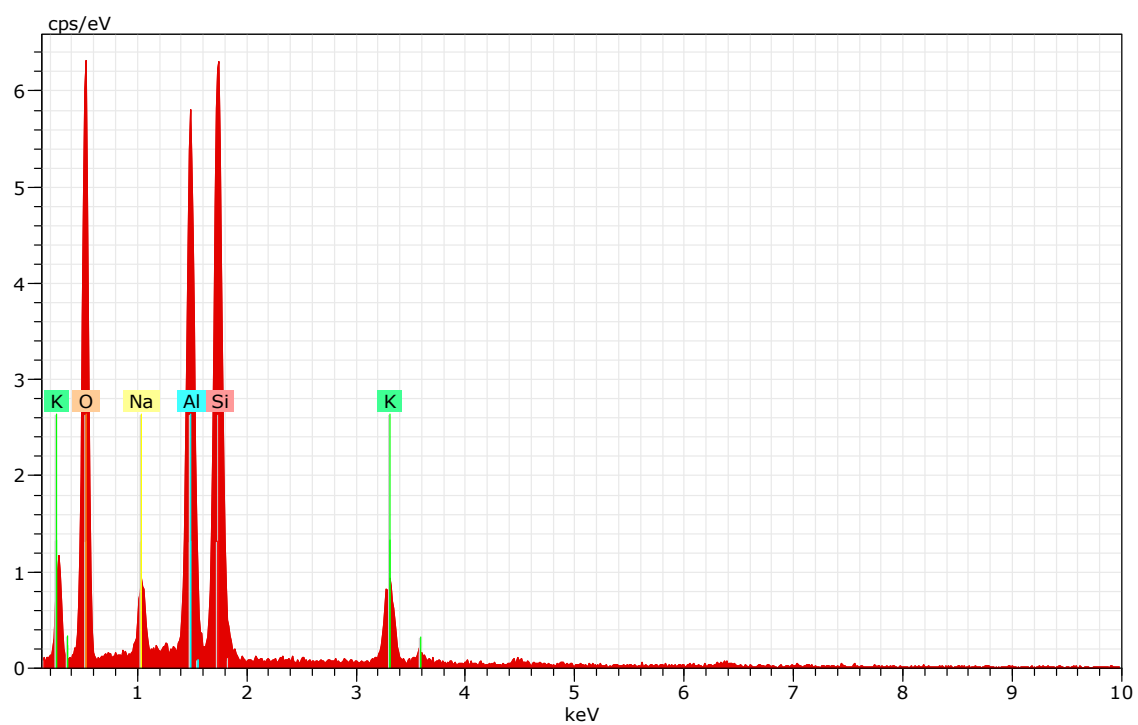


Figure S6. EDS analysis of particle x in Figure 7c.

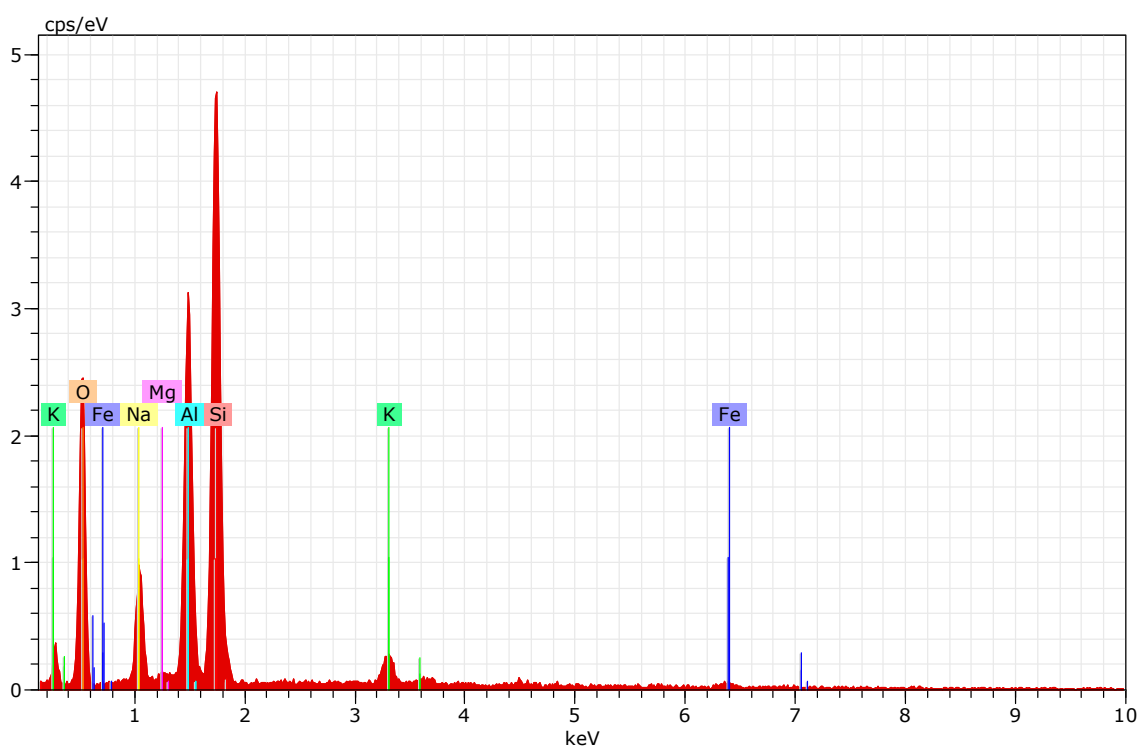


Figure S7. EDS analysis of particle x in Figure 7d.

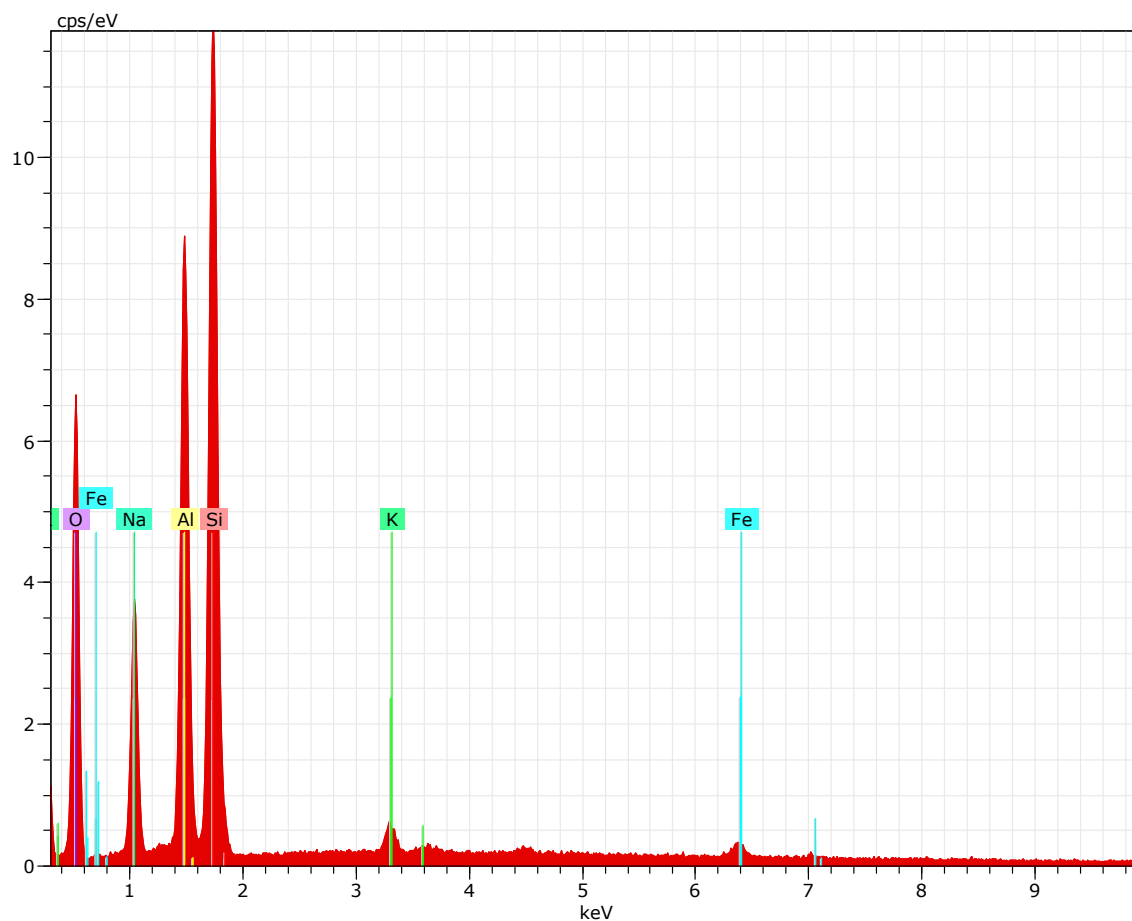


Figure S8. EDS analysis of particles in Figure 8c.

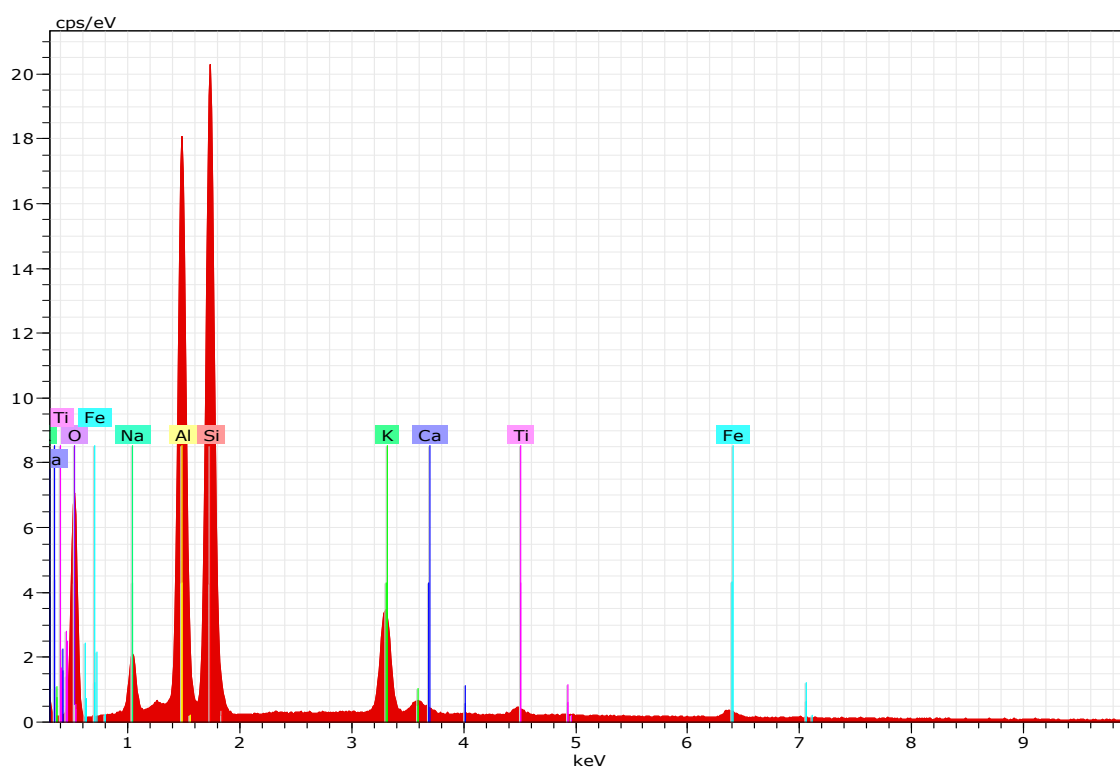


Figure S9. EDS analysis of particles in Figure 9c.

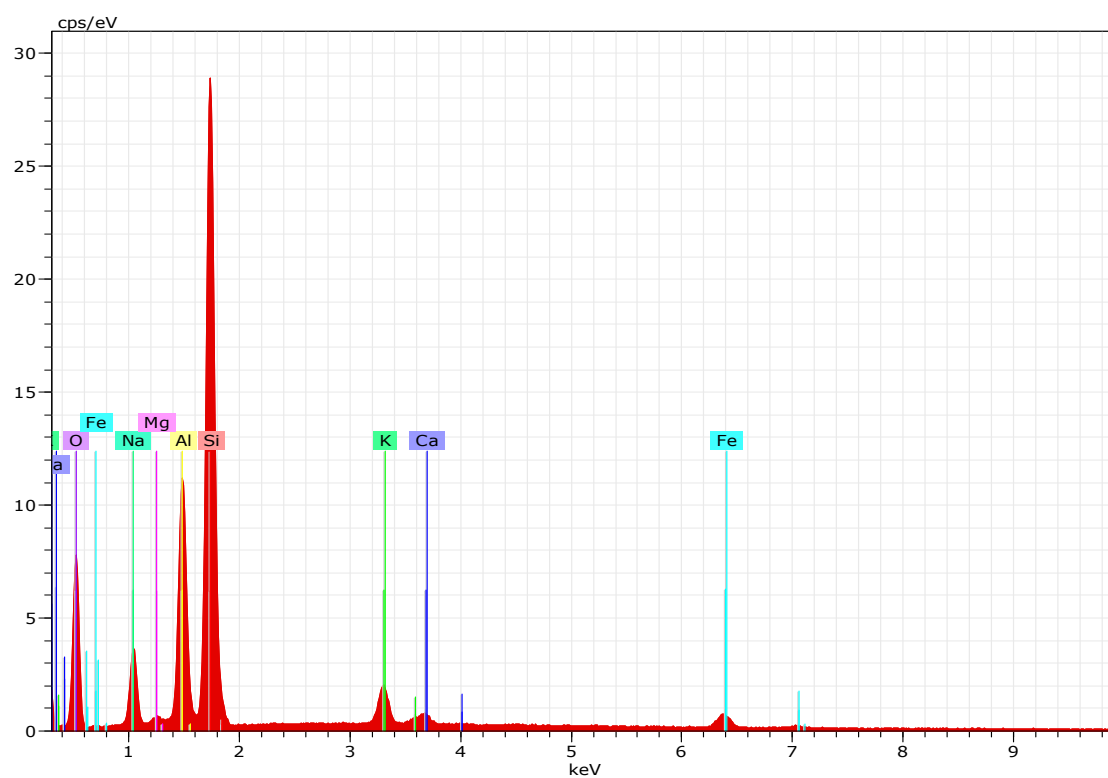


Figure S10. EDS analysis of particle x in Figure 9d.

**Table S1.** Langmuir coefficients for the adsorption of cations onto Alvarães and Barqueiros MK based geopolymers (A25, B25- 25% MK 75% zeolite; A50, B50- 50% MK 50% zeolite; A75, B75- 75% MK 25% zeolite; A100, B100- 100% MK).

| Metal Ion        | Geopolymer | Langmuir Model Parameters |            |            |
|------------------|------------|---------------------------|------------|------------|
|                  |            | R <sup>2</sup>            | b (L/mmol) | Q (mmol/g) |
| Pb <sup>2+</sup> | A25        | 0.9815                    | 5.35       | 0.69       |
|                  | A50        | 0.9910                    | 6.74       | 1.14       |
|                  | A75        | 0.8992                    | 4.21       | 1.43       |
|                  | A100       | 0.9520                    | 4.58       | 1.43       |
|                  | B25        | 0.9983                    | 8.47       | 0.80       |
|                  | B50        | 0.9851                    | 7.93       | 1.37       |
|                  | B75        | 0.9761                    | 5.08       | 1.50       |
|                  | B100       | 0.9960                    | 9.72       | 1.36       |
| Cd <sup>2+</sup> | A25        | 0.9920                    | 92.93      | 0.38       |
|                  | A50        | 0.9977                    | 31.25      | 0.54       |
|                  | A75        | 0.9998                    | 26.37      | 0.85       |
|                  | A100       | 0.9992                    | 15.75      | 1.00       |
|                  | B25        | 0.9929                    | 10.61      | 0.38       |
|                  | B50        | 0.9998                    | 48.51      | 0.73       |
|                  | B75        | 0.9998                    | 21.61      | 0.86       |
|                  | B100       | 0.9999                    | 27.72      | 0.86       |
| Zn <sup>2+</sup> | A25        | 0.9982                    | 15.66      | 0.24       |
|                  | A50        | 0.9983                    | 21.47      | 0.50       |
|                  | A75        | 0.9889                    | 22.06      | 0.56       |
|                  | A100       | 0.8792                    | 18.17      | 0.66       |
|                  | B25        | 0.9977                    | 13.60      | 0.33       |
|                  | B50        | 0.9975                    | 21.42      | 0.58       |
|                  | B75        | 0.9466                    | 14.38      | 0.70       |
|                  | B100       | 0.9919                    | 25.12      | 0.63       |
| Cu <sup>2+</sup> | A25        | 1.0000                    | 84.26      | 0.30       |
|                  | A50        | 0.9943                    | 19.95      | 0.65       |
|                  | A75        | 0.9997                    | 14.70      | 0.84       |
|                  | A100       | 0.9992                    | 13.53      | 0.90       |
|                  | B25        | 0.9959                    | 10.93      | 0.46       |
|                  | B50        | 0.9998                    | 14.24      | 0.85       |
|                  | B75        | 0.9993                    | 9.95       | 0.93       |
|                  | B100       | 0.9999                    | 22.00      | 0.74       |
| Cr <sup>3+</sup> | A25        | 1.0000                    | 79.17      | 0.12       |
|                  | A50        | 1.0000                    | 161.40     | 0.22       |
|                  | A75        | 0.9999                    | 32.79      | 0.26       |
|                  | A100       | 1.0000                    | 44.17      | 0.34       |
|                  | B25        | 0.9875                    | 5.59       | 0.30       |
|                  | B50        | 0.9973                    | 9.77       | 0.45       |
|                  | B75        | 0.9996                    | 18.22      | 0.45       |
|                  | B100       | 0.9791                    | 5.04       | 0.49       |