

## Influence of granitic rock fines addition in the alkali-aggregate reaction (AAR) in cementitious materials

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### Abstract

According to previous studies, fine materials originated from reactive aggregates can act as a Alkali-Aggregate Reaction mitigator, having its effectiveness dependent on their reactivity, fineness and added content. Thus, the present work aims to study if reactive granitic rock fines can mitigate or reduce the AAR and how the fineness of the material influences its mitigation capacity. For this purpose, granitic rock fines (GRF) from 2 different deposits and Pyrex glass fines (PGF) were tested as concrete addition. Each one of these fines was used in two different finesses and added to the concrete at dosage rate of 10% and 20% by mass of cement. It was observed that the addition of GRF did not affect the physical-mechanical properties of concrete and resulted in the reduction in the AAR, being more accentuated with the increase of its specific surface. These results are extremely positive economically and environmentally because it reduces the costs of maintenance of structures and reduces the consumption of new materials, in addition to using an industrial waste.

**Keywords:** alkali-aggregate reaction, durability, granitic rock fines, performance.

## 1. INTRODUCTION

According to the Brazilian Mining Institute [1], in 2017, Brazil produced about 420 million tons of aggregates for civil construction. In the crushing process of the rocks, fine particulate materials are released, with particles smaller than 75  $\mu\text{m}$ . This material is often improperly discarded, generating negative environmental impacts, besides being harmful to human health.

As an alternative to add value to this material, studies about its incorporation in concrete and mortars have been made. However, such alternative should be considered with caution, because some aggregates can cause deleterious reactions in the concrete, known as the alkali-aggregate reaction [2]. For AAR to occur, three factors must occur simultaneously: sufficient amount of alkali in the interstitial solution of the concrete, high humidity level and existence of potentially reactive aggregate [2]. In the absence of at least one of these factors, the reaction does not occur. However, once the reaction has started, it cannot be interrupted. Therefore, the best way to prevent its action is to prevent the AAR from occurring. For this, it is necessary to be cautious when selecting the materials used in concrete production.

Priskulnik [3] indicates several factors that can contribute to the reduction and/or mitigation of the AAR, among them: decrease of concrete permeability due to the low water/cement ratio and use of active mineral additions, such as silica fume and blast furnace slag, because they fix cement alkalis in the initial phase of cement hydration and decrease the pH of the interstitial concrete solution.

Some materials, such as ground glass, when incorporated into the cement matrix may be favorable to the occurrence of the AAR or act as a mitigator, depending on the particle size of the material. When the glass is used in concrete with particle sizes greater than 0.5 mm, the development of the AAR is observed. However, when ground in dimensions smaller than 100  $\mu\text{m}$ , it can present a pozzolanic behavior and reduce the expansion potential of the ASR [7].

Rajabipour *et al.* [8] explain that larger particles (in the small aggregate particle size range) of glass have micro cracks wide enough to allow the diffusion of hydroxyles, which will result in a high concentration of dissolved silica and sodium, since these will have greater difficulty in being released to the solution outside the crack. This high concentration will result in the ASR gel. On the other hand, at the cement-glass interface, the gel formed is not expansive, since silica and sodium are not confined.

Unlike what occurs in larger particles, in smaller particles (such as powders), the intraparticle AAR is minimal, prevailing the interfacial pozzolanic reaction.

As a theoretical basis for the present research, several authors have studied the influence of rock fines in the AAR and proposed theories to explain the reduction of AAR caused by the fines generated from reactive aggregates. In a direct way, due to the reduction of cement consumption, there is the reduction of alkaline ions, making it difficult to occur the AAR [9].

The reactive silica, when finely ground, contributes to the gel forming in a distributed manner in the cement paste. However, when it is present in the aggregates, it causes the accumulation of the alkali-silica gel in specific places, making them potential expansion points [10].

Li, He and Hu [11] concluded that fine materials can act in two ways on cement paste. Due to their fineness, they can act as nucleation points for the paste hydration and thus accelerate the production of portlandite. On the other hand, due to the reactivity of the fine, it can react with the portlandite, resulting in a higher content of formed C-S-H, which has the capacity to agglutinate the alkalis present, thus reducing the AAR. However, the authors warn that, although the sand fines used could contribute to a greater retention of alkalis, the binding capacity is low due to their low reactivity.

He *et al.* [9] argue that the substitution of cement by reactive aggregate fines causes a reduction in ASR due to several factors. The reduction of cement consumption from the substitution of cement by fine causes a reduction in the alkali content available for the reaction. In addition, the presence of amorphous silica and high specific surface causes an increase in calcium hydroxide consumption due to pozzolanic activity, contributing to the reduction of the thickness of the ASR gel around the aggregate and reducing the effects of ASR. Despite reducing the expansion caused by ASR, the substitution of 50% of cement by fine reactive reduced the compressive strength by 35%, in mortars with water/(cement + GRF) ratio equal to 0.47%.

Carles-Gibergues *et al.* [12] used four types of reactive aggregate powders to investigate whether these materials are efficient in suppressing the expansion of ASR caused by the large aggregate. The authors replaced 10 and 20% of the aggregate mass (0.08 to 4mm) with fine (less than 0.08mm) of different finesses, with specific Blaine surfaces varying between 100 and 650 m<sup>2</sup>/kg. As a result, it was observed that the use of the reactive fines reduced the expansion of mortars and that the efficiency of the material depended on the origin, fineness and content used.

The larger surface area of the fine contributes to the higher dissolution rate of silica, resulting in a decrease in the Ca/Si ratio in the C-S-H formed during the hydration of the cement and increasing its capacity to fix the alkalis. The depletion of free alkalis decreases the pH of the pore solution, reducing the attack on the reactive aggregates [12]. Cyr, Rivard and Labrecque [2] studied the AAR in mortars with replacement of 10 and 20% of the sand by reactive aggregate fine (<80 µm) from 11 different types of aggregates. The authors observed a reduction of the expansion that varied from 19% to 78%, depending on the type of aggregate and highlighted some parameters that affect the efficiency of the fines, namely: silica content, fineness of the fine, available alkaline content and specific surface area. Shayan and Xu (2004) showed that glass powder can suppress the reactivity of both coarse glass particles and coarse reactive natural aggregates.

The present study analyzed how the addition of granite rock fines influences the physical-mechanical properties of mortars and the alkali-aggregate reaction.

## 2. MATERIALS AND EXPERIMENTAL PROGRAM

### 2.1 Materials

For the reactivity evaluation of the aggregates and evaluation of the efficiency granitic rock fines in the mitigation of ASR (item 2.2.2), a special cement with high content of alkalis produced by the Brazilian Association of Portland Cement (ABCP) was used, according to NBR 15577 [13]. For the physical-mechanical tests (item 2.2.3), Portland Cement CPII-F 32 was used, as it does not present pozzolanic additions and is a cement that does not mitigate the alkali-aggregate reaction. Table 1.1 shows the chemical composition of the cements used, determined by X-ray fluorescence spectrometry (XRF), using the Bruker S2 Ranger equipment.

Table 1.1. Chemical composition, in oxides, of the cements used.

Cements	Content (wt %)										
	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	MgO	SO <sub>3</sub>	K <sub>2</sub> O	Na <sub>2</sub> O	Others	Na <sub>2</sub> O <sub>eq</sub> *	LOI
CP II-F 32	16.13	3.67	3.04	60.73	3.90	5.30	1.78	0.00	0.49	1.17	4.97
CP ABCP	16.13	4.46	2.69	56.69	3.54	5.74	1.15	1.95	0.72	2.71	6.92

\*LOI = Loss on ignition at 1000°C

Distilled deionized water was used in the molding of the mortars and in the preparation of the solution. The small aggregate used came from the crushing of granitic rock and has a specific mass of 2.77 g/cm<sup>3</sup>. It was sifted, washed and, later, each granulometric fraction was weighed in order to obtain the granulometric composition determined by NBR 15577 [13].

The fines, passing fraction in sieve #200 (75 µm), used were the granitic rock fines (GRF), from two different quarries, defined as A and B, all of them being ground in order to obtain three distinct specific surface of each material. Table 1.2 presents the physical characterization of GRF obtained. The specific surface area was determined by BET (Gemini VII equipment from Micromeritics) and Blaine (Acmel automatic permeability, model BSA1) methods, and the specific mass by helium pycnometry (AccuPyc II 1340 Micromeritics).

Table 1.2. Physical characterization of the fines used

GRF	Blaine surface area (cm <sup>2</sup> /g)	BET surface area (m <sup>2</sup> /kg)	Specific gravity (g/cm <sup>3</sup> )	Average particle diameter (µm)
FA1	2042 ± 1	11500		55.13
FA2	5936 ± 37	35200	2.86 ± 0.01	8.39
FA3	6665 ± 30	46174		4.43
FB1	3521 ± 12	25700		17.61
FB2	5233 ± 4	39500	2.83 ± 0.01	7.71
FB3	6599 ± 13	52127		3.24

## 2.2 Methods

### 2.2.1 Materials Characterization

After obtaining the fines, they were characterized as to their granulometric distribution. For this, the Mastersizer 3000 Hydro 3000 laser granulometer was used.

The chemical compositions of the fines were determined by X-ray fluorescence spectrometry (XRF), using the Bruker S2 Ranger equipment and the pozzolanic activity was determined by chemical titration test, according to the European standard EN 196-5 [14], replacing 25% of the cement with fine.

The mineralogical characterization of cements and fines was performed by the X-ray diffraction (XRD), using a D2 Phaser, Bruker diffractometer, with 10mA and 30Kv copper target tube, wavelength (λ) equal to 0.15406nm, without filtering system with secondary monochromator. The diffraction spectra were obtained in the range 2θ from 5° to 70°, continuous mode at 0.1/s and the phases were identified using the software DIFFRAC plus-EVA, with the Crystallography Open Database (COD) centered database.

### 2.2.2 Evaluation of the alkali-aggregate reaction

In the analysis of the evaluation of the occurrence of the alkali-aggregate reaction and assessment of the efficiency of granitic rock fines in the mitigation of ASR, the accelerated method was used in mortar bars, according to NBR 15577 [13] in parts 4 and 5.

For these tests, mortars were molded with the formulation, in mass, of 1: 2.25 : x : 0.47 (cement : aggregate : GRF : water), being x the GRF content, equal to 0 for the reference mortar (without GRF) and 0.10 and 0.20 for mortars containing 10% and 20% of GRF, respectively.

The introduction of granitic rock fines was performed in addition to cement so that it remained constant in all specimens studied, also keeping constant the cement/aggregate ratio. Moreover, a previous study showed that the substitution of cement by GRF, despite being efficient to reduce the AAR, caused a high loss of mechanical resistance [8].

Table 2.1 presents the identification, the formulations, the water/(cement+GRF) ratio and cement consumption of the mortars studied. It is worth mentioning that in this stage all the formulations were molded using the cement supplied by ABCP.

Table 2.1. Design parameters of the of the mortars mixes

Mortars Identification	Mix proportion by weight	Water/ (cement + GRF) ratio	Cement consumption (kg/m <sup>3</sup> )
REF	1: 2.25: 0.47	0.47	600.10
A10FA1/A10FA2/A10FA3	1: 0.10: 2.25: 0.47	0.43	587.77
A20FA1/A20FA2/A20FA3	1: 0.20: 2.25: 0.47	0.39	575.93
A10FB1/A10FB2/A10FB3	1: 0.10: 2.25: 0.47	0.43	587.64
A20FB1/A20FB2/A20FB3	1: 0.20: 2.25: 0.47	0.39	575.69

For each formulation, three CPs (2.5 x 2.5 x 28.5 cm<sup>3</sup>) were molded, according to NBR 15577-4 [13]. About 24 hours after molding, the CPs were immersed for 24 hours in distilled water at 80°C and then immersed in 1N Na(OH) solution at 80°C for 28 days. The specimen expansion was measured every two days.

### 2.2.3 Evaluation mechanical strenght of mortars

For mechanical strength performance analysis, axial compression and flexural tensile strength tests were performed at 3, 7 and 28 days of cure in water at 24°C, and after 28 days immersed in Na(OH) [1M] solution, following NBR 13279 [15]. Four samples were tested in flexure and five samples in axial compression, using half of the CPs ruptured in flexure. In addition, the capillary water absorption, according to NBR 9779 [16] and apparent density and porosity, following NBR 9778 [17], were determined at 28 days of cure in water saturated with lime and at 28 days in Na(OH) solution.

## 3. RESULTS AND DISCUSSION

### 3.1 Materials Characterization

Table 3.1 shows the chemical composition, in oxides, of the GRF used. It can be observed that these have higher levels of silicon (SiO<sub>2</sub>) and aluminum (Al<sub>2</sub>O<sub>3</sub>) oxides than the other oxides present in the material. It is noted that the aggregate used in this research has the same origin of FA and consequently the same chemical composition.

Table 3.1. Chemical composition, in oxides, of the granitic rock fines studied

Materials	Constituents (%)									
	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	MgO	SO <sub>3</sub>	K <sub>2</sub> O	Na <sub>2</sub> O	Others	LOI*
FA	54.21	15.77	9.31	5.81	4.93	0.33	2.70	3.75	1.80	1.40
FB	59.66	15.63	8.93	5.26	4.33	0.86	2.36	0.00	1.29	1.69

\* Loss on ignition at 1000°C

Figure 3.1 shows the granulometric distribution of cements and GRF used. Fines FA1 and FB1 have D50 larger than cements, while fines FA2, FB2 have D50 smaller than cements. Fines FA3 and FB3 have D50 smaller than index 2 fines due to the longer grinding time of the fines represented by index 3.

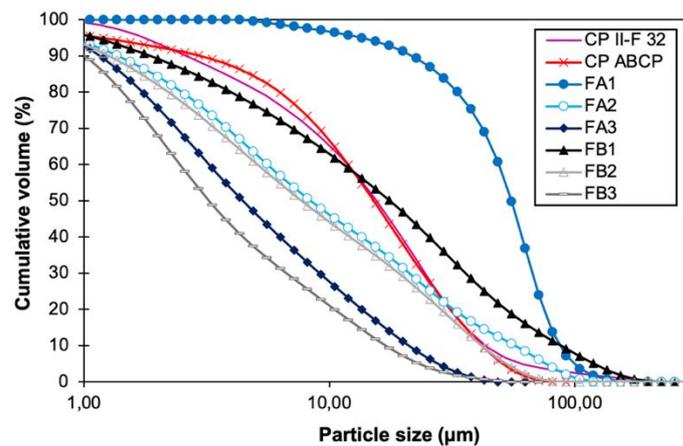


Figure 3.1. Particle size distribution of cements and GRF used.

Figure 3.2 shows the cements diffractogram (Figure 3.2a) and GRF (Figure 3.2b) used. The cements (Figure 3.2a) present the same crystalline phases, being identified as the phases alite ( $C_3S-3CaO.SiO_2$ ), belite ( $C_2S-2CaO.SiO_2$ ),  $C_4AF$  ( $4CaO.Al_2O_3.Fe_2O_3$ ), cubic  $C_3A$  ( $3CaO.Al_2O_3$ ), orthorebic  $C_3A$  ( $3CaO.Al_2O_3$ ), calcite ( $CaCO_3$ ), gypsum ( $CaSO_4.1/2H_2O$ ), arcanite ( $KSO_4$ ), and periclase ( $MgO$ ).

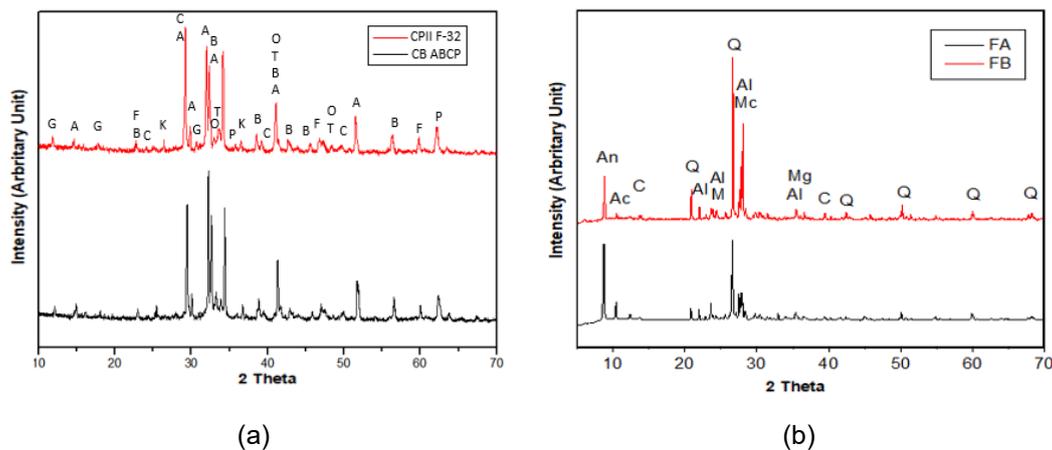


Figure 3.2. Identification of the crystalline phases of the (a) cements and (b) GRF studied. A-Alite; B-Belite; F- $C_4AF$ ; T-cubic  $C_3A$ , O-orthorombic  $C_3A$ , C-Calcite, G-Gypsum, K-Arcanite, P-Periclase; Al-Albite; Q-Quartz; An- Annite; M-Microcline; Ac-Actinolite; Mg-Magnetite; C-Caulinite.

The granitic rock fines (A and B) have very similar mineralogical compositions, with the presence of the minerals albite ( $NaAlSi_3O_8$ ), quartz ( $SiO_2$ ), annite [ $KFe_3^{2+} AlSi_3O_{10}(OH)_{1,5}F_{0,5}$ ], microcline ( $KAlSi_3O_8$ ), actinolite [ $Ca_2(Mg,Fe^{2+})_5Si_8O_{22}(OH)_2$ ], magnetite ( $FeO.Fe_2O_3$ ), dolomite [ $CaMg(CO_3)_2$ ] and kaolinite [ $Al_2Si_2O_5(OH)_4$ ].

As the GRF were used as mineral addition to the cement, the pozzolanicity analysis was performed by the modified Fratini method, which evaluates the consumption of hydroxyl ( $OH^-$ ) and calcium oxide ( $CaO$ ) from pastes containing cement and the GRF. The results obtained are presented in Figure 3.3.

The presence of alkaline ions in the solution causes the portlandite [ $Ca(OH)_2$ ], formed during cement hydration reactions, to release hydroxyl ( $OH^-$ ) in order to balance alkaline sodium ( $Na^+$ ) and potassium ( $K^+$ ) cations [10].

By the test performed, only FA3 and FB3 fines were characterized as pozzolanic materials. However, although FA1, FA2, FB1 and FB2 fines were characterized as non-pozzolanic materials, their presence in the mixture caused a reduction of hydroxyl ions, due to a lower amount of cement in the mixture or

due to ion retention by the GRF. Complementary tests are necessary so that the GRF studied can be used as pozzolanic materials.

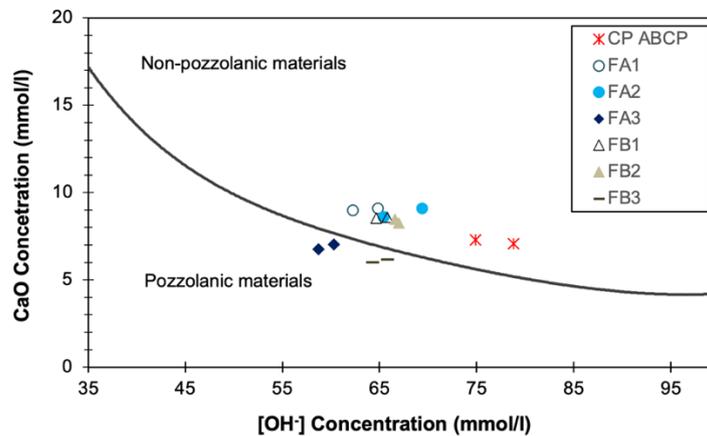


Figure 3.3 Result of the chemical titration test, according to standard NP EN 196-5.

### 3.2 AAR accelerated mortar bar test

For the accelerated mortar bar test, the GRF studied were added to the mixture at levels of 10% and 20% by cement mass and the results are presented in Figure 3.4, for mortars containing FA and FB, respectively. It can be observed that, at the end of the test, only the mortars containing FA1 and FB2 fines presented expansions lower than 0.19% (limit, according to Brazilian standard), these fines being characterized as reaction mitigators. For a better view of the results, the expansions of the mortars containing the granitic rock fines A (Figure 3.5a) and granitic rock fines B (Figure 3.5b) at 28 days in solution of NaOH 1N at 80°C are presented.

The FA1 fine addition (Figure 3.4a) obtained a greater expansion reduction when added at the content of 10% than for the 20% fine addition content, because the mortar A20FA1 obtained the same expansion as the reference mortar, this same effect was seen for the mortars with FB1 addition (Figure 3.4b). This effect suggests that the specific area of the fine is not sufficient to significantly reduce the expansion of mortars. Since, as shown in the particle size distribution, the GRF have some particles larger than 75 µm and the higher content added contribute to the alkali-silica reaction.

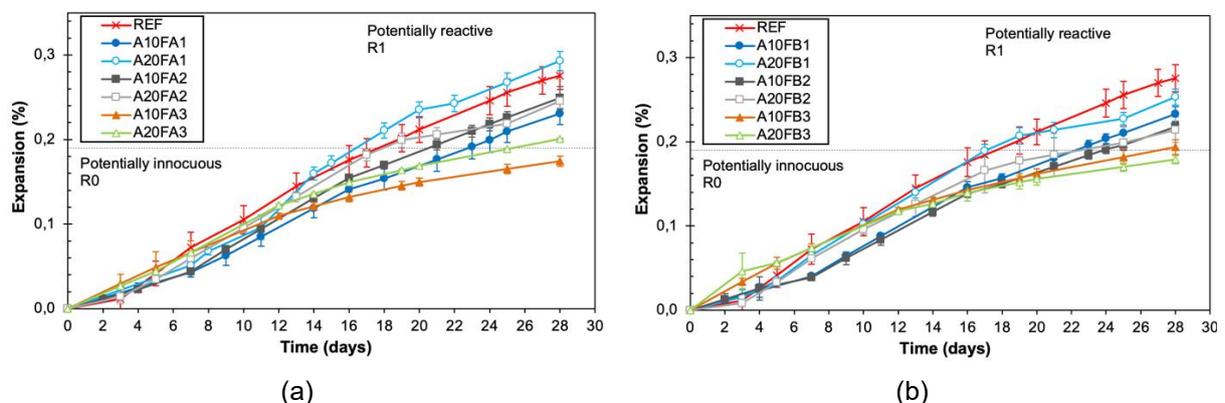


Figure 3.4. Expansion of the mortars, containing the fine of origin A and B, during the accelerated test for evaluation of the alkali-aggregate reaction (AAR) and the classification ranges.

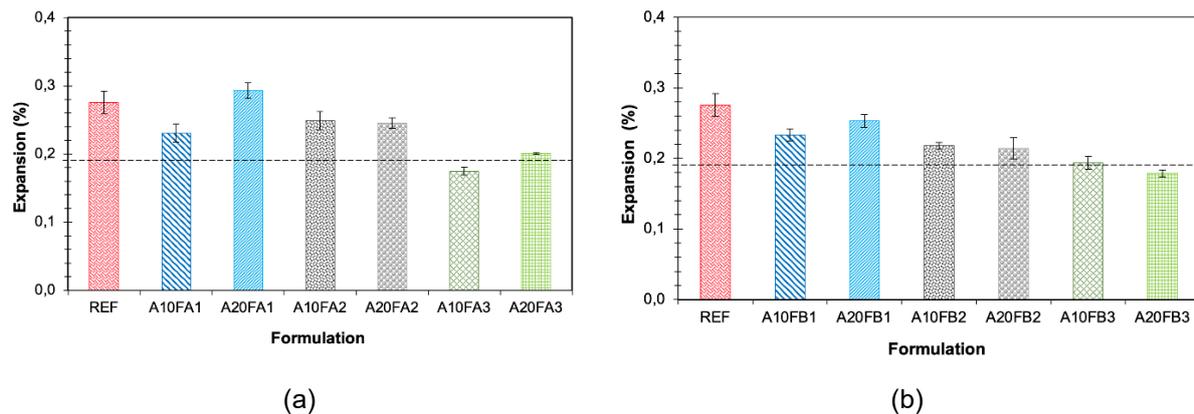


Figure 3.5. Expansion of mortars containing 10% and 20% of fine of origin A and B, after 28 days, in NaOH 1N solution.

Regarding the FA2 and FB2 fines (Figure 3.5a and Figure 3.5b), the addition of these materials caused a reduction in the mortar expansion. However, the addition of 10% and 20% of each fine obtained the same efficiency. These results suggest that it is necessary to add even higher amount of fines in order to mitigate the reaction in order to obtain expansions smaller than 0.19% at 28 days.

When analyzing the expansion results of mortars containing FA3 (Figure 3.5a), it was found that 10% addition of this fine was sufficient for the expansion of the mortar to be in the expansion zone degree 0. However, by adding 20% of this same fine, there was a small increase in expansion compared to the addition of 10%. These results suggest that the optimal incorporation content for the mitigation of the expansion by FA3 fine is around 10%. In Australia, the limit is 0.10% after 21 days and according to this lower limit, none of the expansion values are suppressed to sufficiently low values to fall in the safe zone.

For the FB3 fine (Figure 3.5b), the results show that 10% of addition of this fine contributed to reduce the expansion of the mortar studied, but the limit defined in Brazilian standard is reached only for the 20% of fine addition. Considering the standard deviation, the expansion of mortar A10FB3 is very close to 0.19%, so it is likely that an addition around 15% of the fine FB3 is sufficient for ASR mitigation.

Such findings corroborate to the results obtained in the pozzolanic evaluation of the GRF (Figure 3.3), where only the fines characterized as pozzolanic (FA3 and FB3) were efficient in reducing the expansion of mortars to values below 0.19%.

A significant increase in the expansion of mortars could have occurred due to a higher content of reactive silica present (due to the sum of reactive silica contained in the aggregate and contained in the fine added). However, it is observed that the increase in the surface area of the GRF added has contributed to a significant reduction in the expansion of mortars, for all types of GRF.

The fine presence can reduce the AAR because, due it has a higher fineness, being more reactive than the aggregate [20]. This interaction of the hydroxyls with the silica present in the GRF can result in an expansive gel or the C-S-H gel, not expansive.

If the gel is expansive, the gel formed around smaller particles has a smaller thickness than the gel formed around the aggregate, causing less expansion of the mortar [9]. Therefore, the preferential attack of the hydroxyl ions to the GRF causes a smaller mortar expansion.

Due to the nature of the test, where the mortars are inserted in a solution rich in NaOH at 80°C, it is not possible to assess whether the consumption of OH<sup>-</sup> by the GRF causes a reduction in the AAR, since alkaline hydroxides are supplied continuously to the mortar [18]. Thus, although the accelerated test has shown that the addition of the GRF did not cause an increase in the expansion of the mortars, it is necessary that the test be performed on concrete bars or mortar bars without the insertion of the specimens in the alkaline solution. Such tests are recommended by NBR 15577 [13].

### 3.3 Mechanical Strength of mortars containing GRF

Figure 3.6 presents the results of axial compressive strength of the mortars studied.

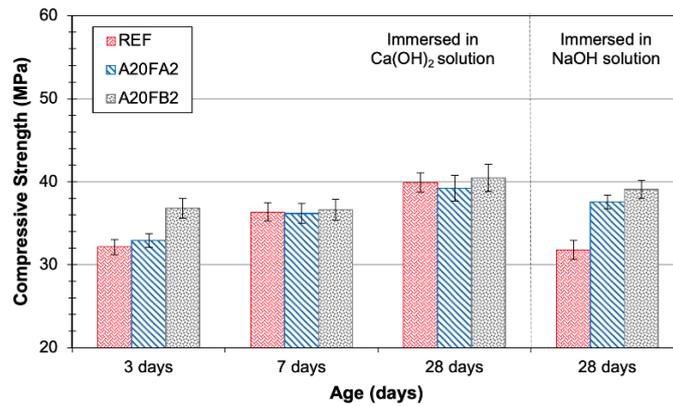


Figure 3.6. Compressive strength of reference mortars and containing 20% of the GRF, at 3, 7 and 28 days immersed in saturated solution in lime and at 28 days immersed in solution of NaOH 1N.

Statistically, only the presence of the fine FB2 caused a significant increase in the resistance to axial compression, in relation to the reference mortar, at 3 days. However, at 7 days and 28 days of curing immersed in Ca(OH)<sub>2</sub> solution at 24°C, the compressive strength of the samples was statistically the same. It is worth noting that cement consumption reduced with the increase in granitic rock fines, but the water to aggregate ratio was kept the same for all samples. When comparing the curing methods used, it was found that the reference mortar was more significantly influenced when compared to the other formulations, having a greater reduction in compressive strength when inserted in NaOH solution at 80°C. For the mortars containing the FA2 and FB2 fines, the curing method did not significantly influence the axial compressive strength.

Figure 3.7 shows the resistance to flexural tensile strength of the mortars, which was not significantly altered due to the introduction of the GRF studied after 3 and 7 days of cure. It was also observed that the immersion of the reference mortar in NaOH solution caused a reduction in the tensile strength in bending, however the strengths of mortars containing FA2 and FB2 were not influenced by the curing method.

As for the curing method, it should be noted that both the curing immersed in water (saturated in Ca(OH)<sub>2</sub>) and in NaOH solution at 80°C, provide an environment with basic pH, and the exchange of calcium hydroxide for sodium hydroxide favors the occurrence of the alkali aggregate reaction. Thus, the hydration reactions of the mortars are not significantly altered (during 28 days exposure), which explains the maintenance of strength values to mortars containing GRF.

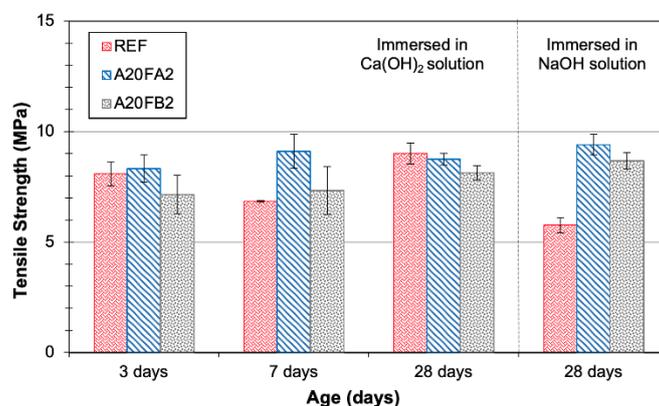


Figure 3.9. Tensile strength in the bending of reference mortars and containing 20% of the GRF, at 3, 7 and 28 days immersed in saturated solution of lime and at 28 days immersed in solution of NaOH 1N.

For the reference mortar, the expansion due to AAR may have caused a weakening in the matrix, thus reducing its mechanical resistance. However, the tensile strength and modulus of elasticity are more sensitive than axial compression to AAR cracking [18, 24]. This factor may be related to the microscopic damage caused by the AAR in the aggregates that impair the bond between these and the cement paste due to changes in its characteristics, such as texture, resistance, hardness, among others [23].

De Souza *et al.* [24] describe those significant reductions in compressive strength occur when the expansion levels are high, with expansions close to 0.30%, due to the large amount of cracks in the cement paste, forming a network of cracks [25].

The small influence of the occurrence of AAR on the tensile and compression resistances of mortars in the presence of fine reactive can be explained by the reduction of the expansion pressure caused by the penetration of the expansive gel in the aggregate [18] or due to the formation of low alkali gel in mixes containing fine powders. Thomas [10] explains that the size of amorphous silica influences the formation of the expansive gel, because finely divided materials cause the gel to form in a manner distributed throughout the cement paste, while larger particles lead to the accumulation of the alkali-silica gel in specific locations, making them points of expansion. The formation of the gel in a distributed manner causes that, if there is a breakage of the particles due to the expansion of the gel, it will interfere less in the matrix the smaller its size is.

## 4. CONCLUSIONS

According to results obtained, it's possible conclude:

- The addition of granitic rock fines reduced cement consumption without significantly altering the physical-mechanical properties of mortars;
- The addition of granitic rock fines presented a reducing effect of the ASR, which was intensified as the fineness of these fines increased, indicating that the probable increase in the amount of reactive silica dissolved in the solution contributed to consuming the alkalis in the first ages;
- The granitic rock fines with surface area above 600 cm<sup>2</sup>/g acted as a mitigator of the alkali-aggregate reaction, evaluated by accelerated testing on mortar bars;
- It should be noted that there is a need for complementary tests and with greater execution time, such as concrete prism tests, to prove the mitigating effect of fine;
- Fines can also release alkali into the pore solution in the process of reacting with lime, which could increase the expansion. This effect needs to be evaluated, why in the present work didn't determine the alkali contribution from the fines;
- The immersion of mortars containing granitic rock fines in Na(OH) solution during 28 days did not cause changes in their physical-mechanical properties, unlike what occurred for reference mortars.

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