2021 GEOPOLYMERCAMP

Mechanically Activation

of Low Calcium Fly Ash (Class F)

for Geopolymer Concrete:

The use of stored and dumped Fly Ash piles.

Review of several papers by Joseph Davidovits.

Overlooked by all experts, including United Nations Environment experts and myself.

Burning of 10 t Carbon (C=12 g/mol.) produces 36.66 t of CO_2 (CO_2 = 44 g/mol.). But the burning of coal generates 10% by weight of fly ash. In other words,

10 t coal is producing 1t fly ash and emits 33 t CO_2.

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Fly ash-based cement is supporting the burning of coal and increase global warming.

Admittedly, the material is available and sometimes stored in large quantities.

I think it is not suitable for long-term mass production, only for local short-term markets or technical specialties.

Therefore, we should stop promoting coal-fly ash-based geopolymer cements !

Rock-based ferro-sialate geopolymer cement.

Joseph Davidovits, 12/01/2020; DOI:10.13140/RG.2.2.34889.29283

2020
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minerals June 2021

Article

Geopolymers Based on Mechanically Activated Blended with Dolomite

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REMEDIATION TREATMENT August 2021

Synthesis of geopolymers based on mechanicall low-calcium iron-rich fly ash

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Man-made deposits of coal ash (fly ash and bottom ash), are found in the majority of thermal power stations and many industrial plants. The total annual production of coal ash worldwide, mainly fly ash (FA), is about 700 to 800 million tons, of which less than one-third is recycled.

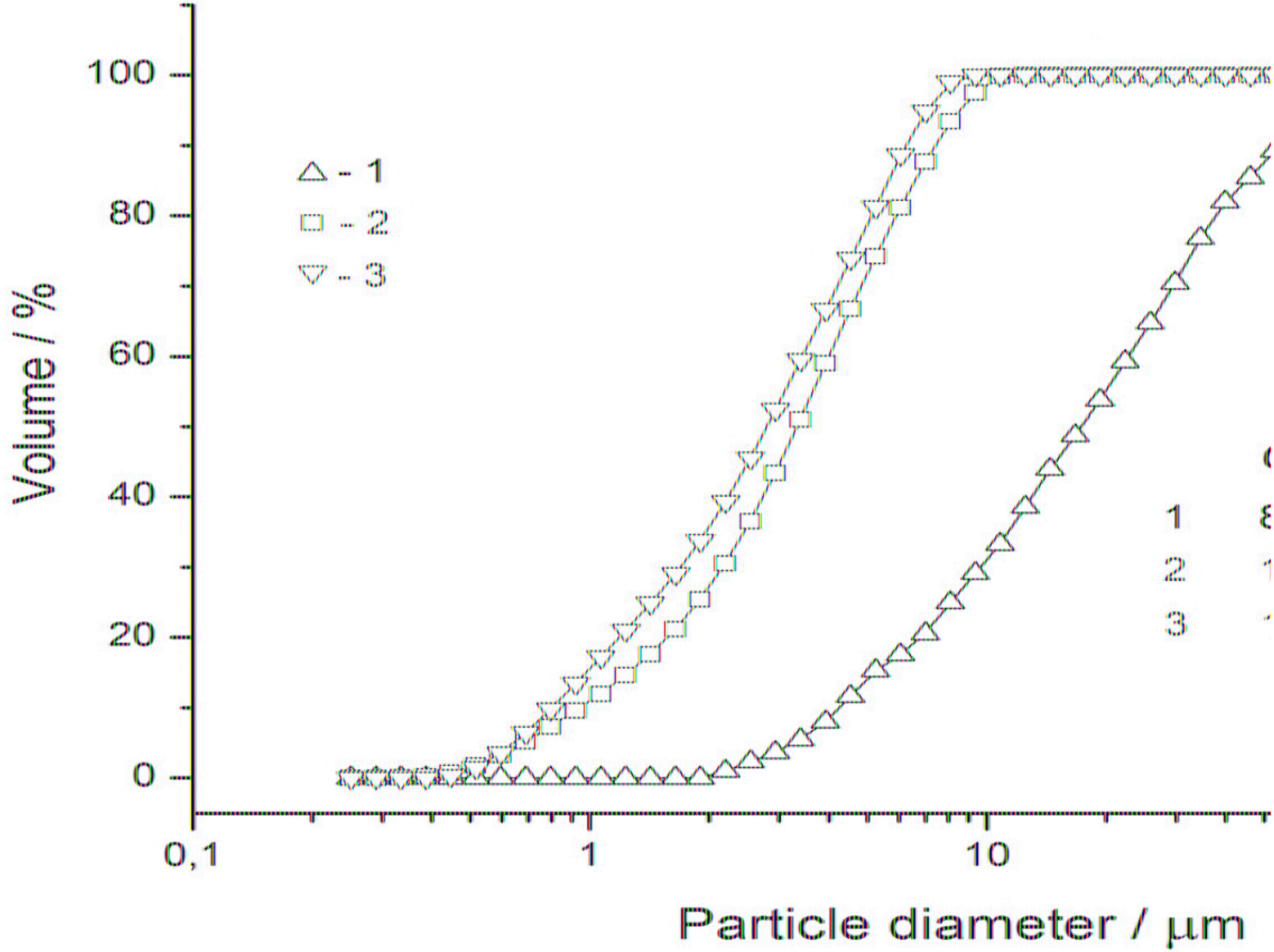
The accumulated FA has become a problem for the environment (….) The mineral composition of FA is mainly represented by the glass phase and also by quartz, mullite, magnetite, and other minerals. In the last two decades, intensive studies have been carried out on the use of FA for the preparation of geopolymer materials.

One way to improve the performance of the FA-based geopolymers is the mechanical activation (MA) of FA in mills. Here, the terms "mechanical activation" (MA) and "milling" refer to the same process of mechanical treatment of a solid material. (…)

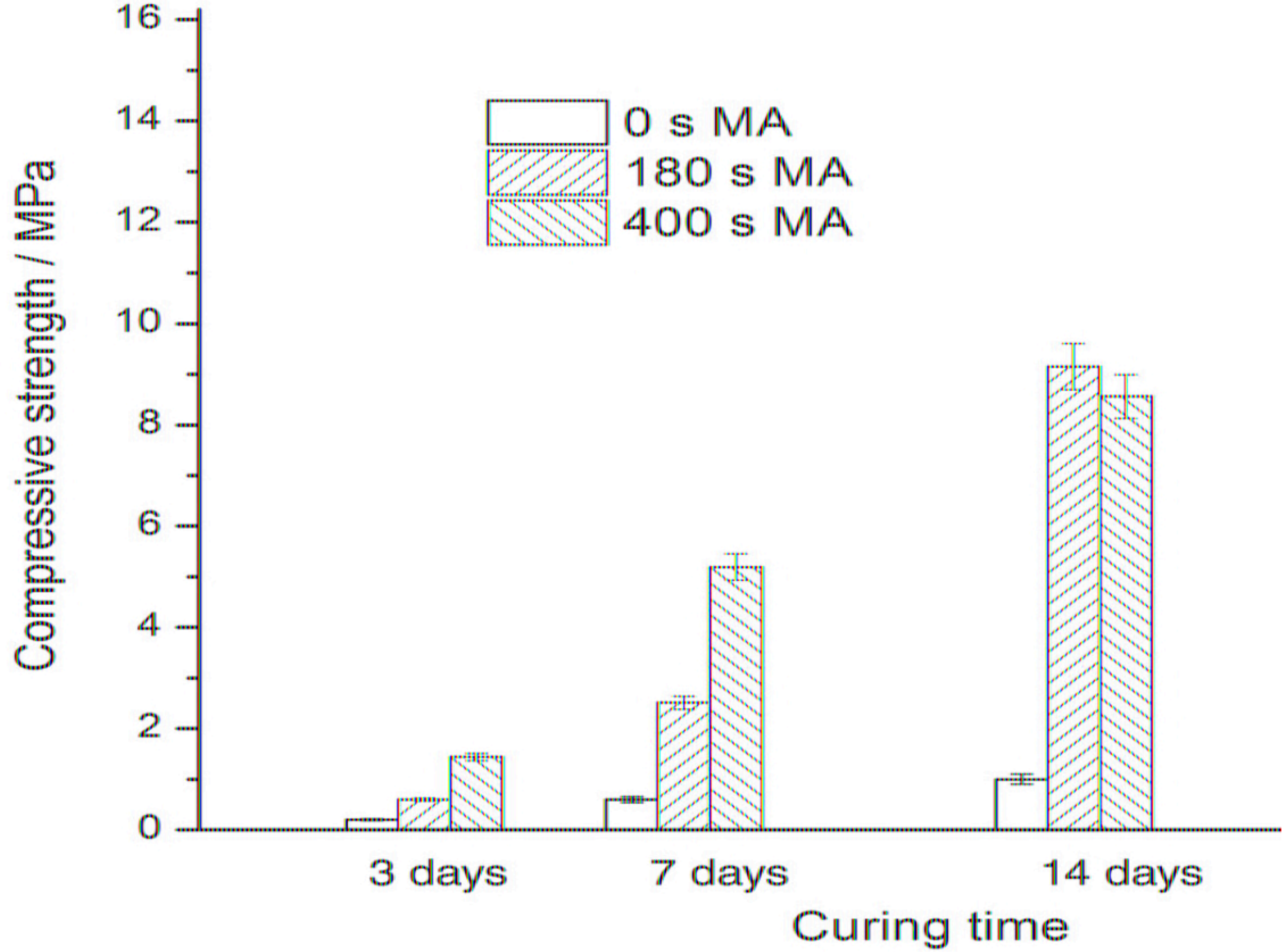
Importantly, mechanical treatment of FA in mills leads not only to a decrease in particle size (and increase in surface area), mainly in the initial stage of milling, but also an increase in FA reactivity compared with that of alkaline agent per unit surface area.

The increase in FA reactivity is explained by an increase in the amount of the amorphous (glass) phase and the generation of defects on the surface and in the bulk of the FA particles.

MA was carried out in an AGO-2 laboratory planetary mill (Novic, Novosibirsk, Russia) in air at a centrifugal force of 40 g. Steel vials and steel balls 8 mm in diameter were used as the milling bodies. The details of MA are described in



Particle size distribution: 1- the initial FA; 2- the FA milled for 180s, 3min. 3- the FA milled for 400s, 6.5 min..

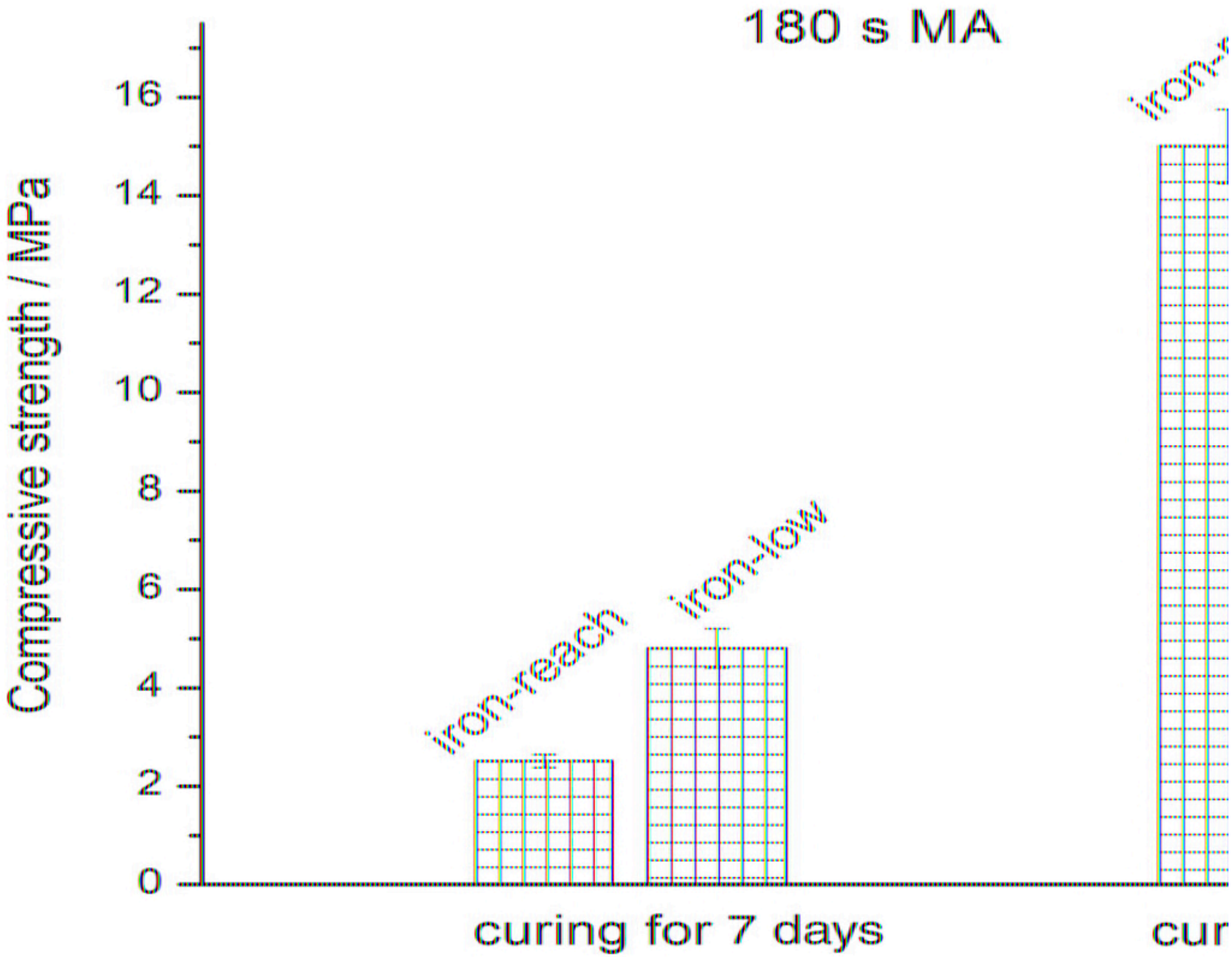


Effect of MA and curing time on the compressive strength of geopolymers

One can also note the “over-grinding” effect observed for geopolymers based on FA milled in various mills.

The FA particles do not fully react with the alkaline agent forming the geopolymer gel. Thus, unreacted particles in the geopolymer can be considered as a micro-filler.

As a result, the strength of geopolymers based on FA milled for a shorter time may be higher than that based on FA milled for a longer time due to the optimal particle size distribution which may be another factor affecting the mechanical properties of geopolymers.



The compressive strength of geopolymers based on low-calcium iron-reach FA and low-calcium ash with lower iron content [35] at the age of 7 and 28 days. The MA time for both FAs was 180 s

Springer Link

Factories of the Future pp 383-40

Chapter 8

Mechano-Chemistry of Rock Materials f… Production of New Geopolymeric Cemen…

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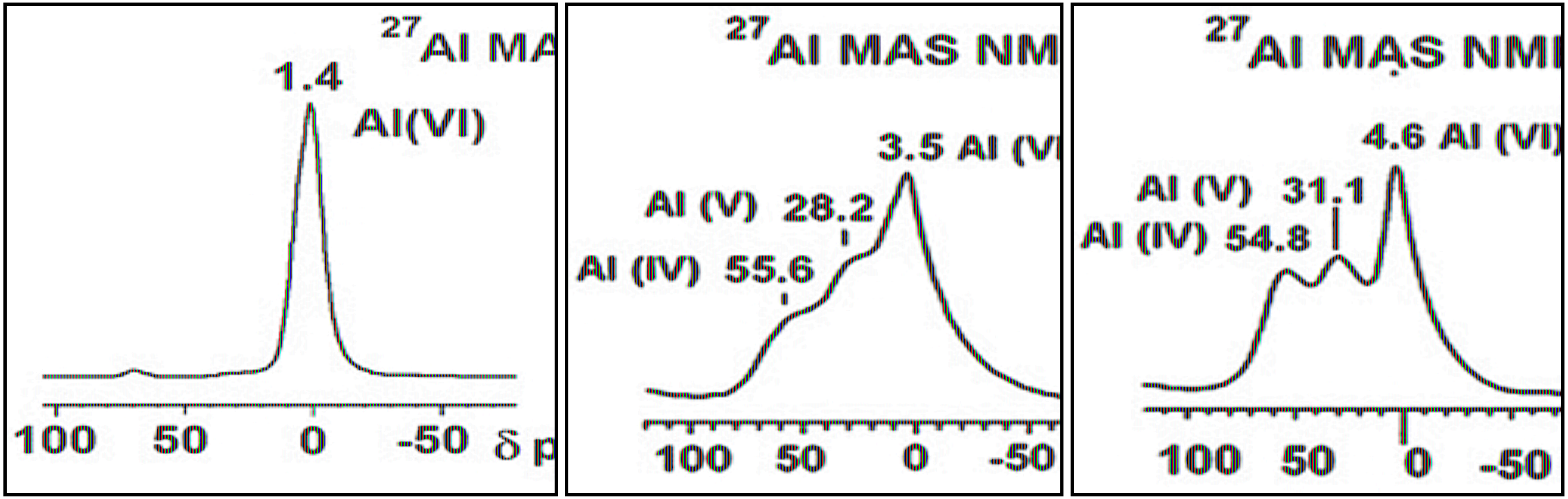
Abstract: (..) In this chapter, mechano-chemical processing (grinding technique) of kaolin clays to produce metakaolin (MK) for the synthesis of Si–Al geopolymers is proposed as an alternative process to replace thermal treatments performed at 650–850 °C.

Results obtained show that the mechano-chemical process is also suitable to make low cost blended Si–Al Rock-based geopolymers.

The compatibility of mechano-chemistry with industrial production was investigated by building a prototype milling system that was tested in a small industrial facility producing zeolites from industrial wastes. The degree of automation allowed the prototype to work unattended for 10 months.

Based on the results obtained from these tests, a milling system for a full scale production of mechano-chemically activated rock materials was designed, and its performances analysed.



Raw Kaolin clay

MK-650°C 2 hours

MK-mechano-chem
30 min., 1,500 r/min.

Appropriate technology in manufacturing Rock-based Ferro-sialate geopolymer cements.