

EFFECT OF PHOSPHATE-BASED RECYCLED CONCRETE AGGREGATE TREATMENT ON THE DETERIORATION OF STEEL REINFORCEMENT

Víctor Galvis¹, Santiago Usme - Guarín¹, Daniela González - Betancur¹, Diana Gómez- Cano¹, Sebastián Meneses- Munera², Yhan Paul Arias¹.

Architecture school, Construction department, Universidad Nacional de Colombia sede Medellín. ¹

Institución universitaria Pascual Bravo, Medellín, Colombia. ²

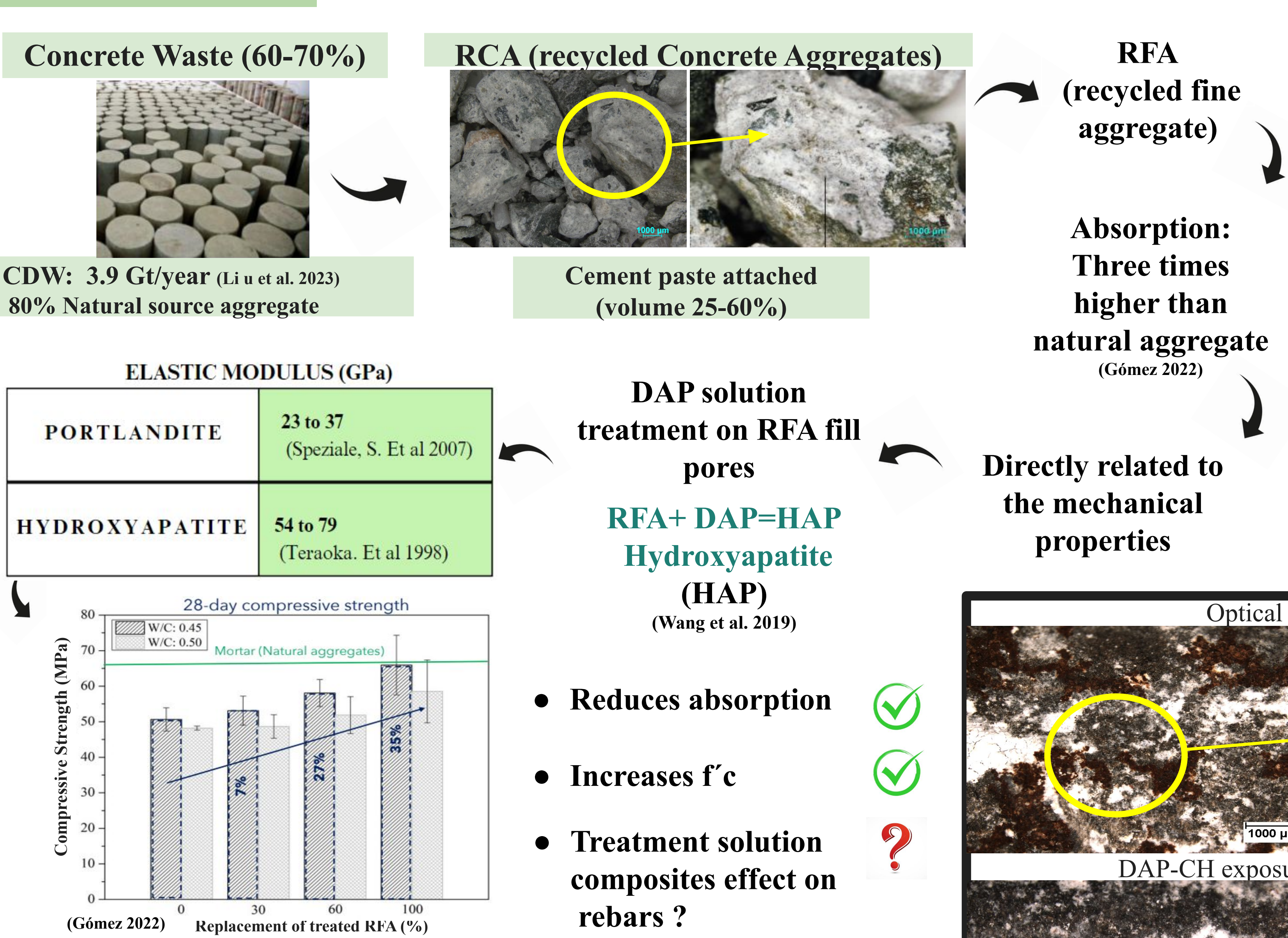
Corrosion Project-Semillero de Investigación en Ingeniería Circular para la Construcción



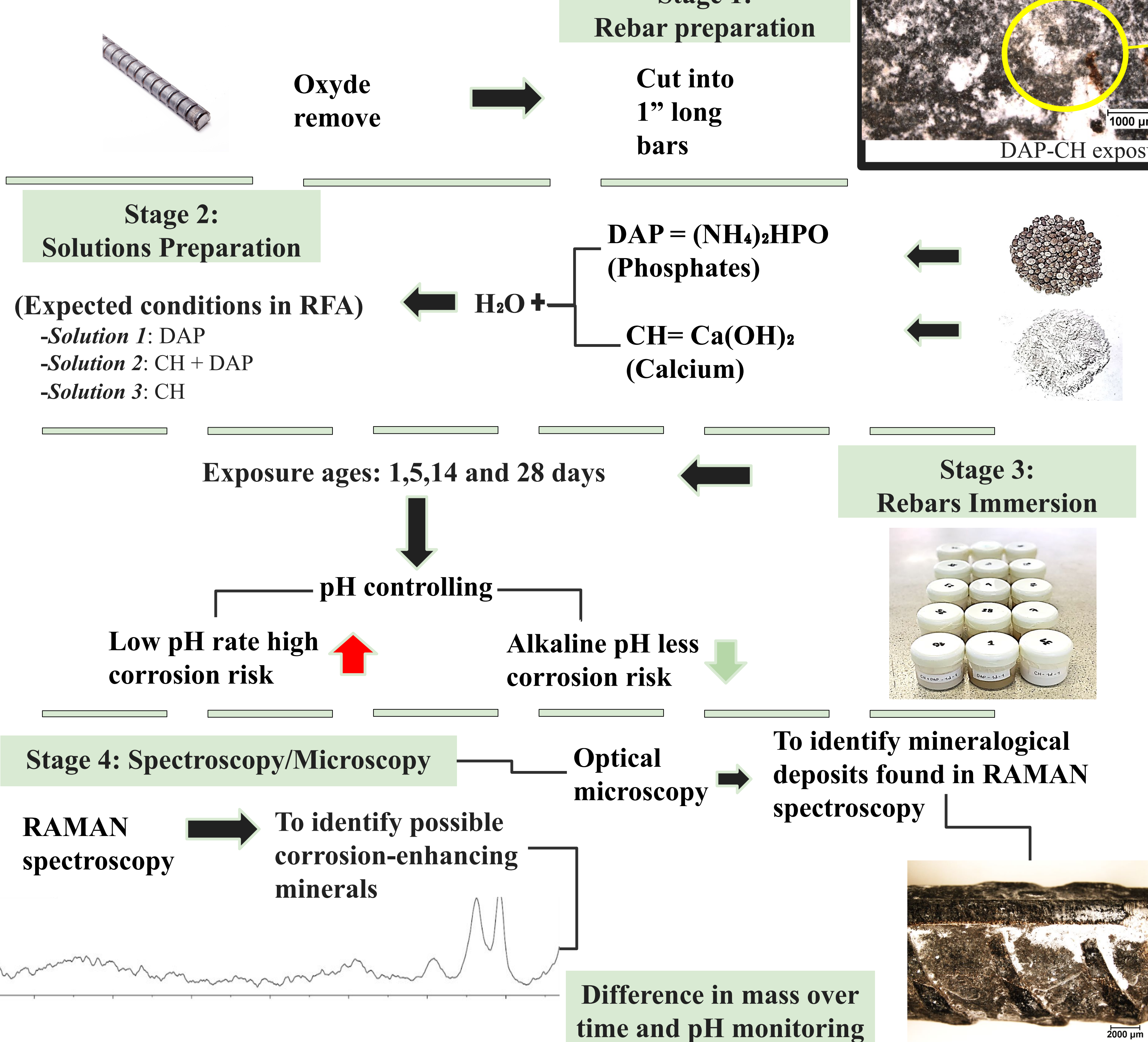
ABSTRACT

The scientific literature shows that concrete mixes improve their mechanical performance when recycled concrete aggregates treated with diammonium phosphate (DAP) are used. However, the effect of this treatment on reinforcing steel is unknown. This study focuses on the influence of mixed DAP and calcium hydroxide- $\text{Ca}(\text{OH})_2$ solutions on the corrosion of reinforcing steel. An evaluation of the following three solutions in water was carried out: commercial DAP used as a soil fertilizer; DAP + $\text{Ca}(\text{OH})_2$; and $\text{Ca}(\text{OH})_2$ solution was used as a reference sample. Reinforcing bars ($\frac{3}{8}$ "") were exposed by immersion in the solutions to determine the stability of the system over time. The phases formed as a function of the exposure time 1,5,14 and 28 days were identified by RAMAN spectroscopy and optical microscopy. According to the different analyses, it was possible to observe the formation of iron phosphates and calcium phosphate such as hydroxyapatite, which in some cases act as a protective layer of the steel during corrosion. However, when there is a high presence of phosphates, in variable pH and humidity environments, they act as electrolytes generating pores in the steel and accelerating the deterioration process. The results will help to establish minimum conditions of DAP concentration to improve the quality of the treated recycled concrete aggregates, avoiding the deterioration of the reinforcing steel.

1. BACKGROUND



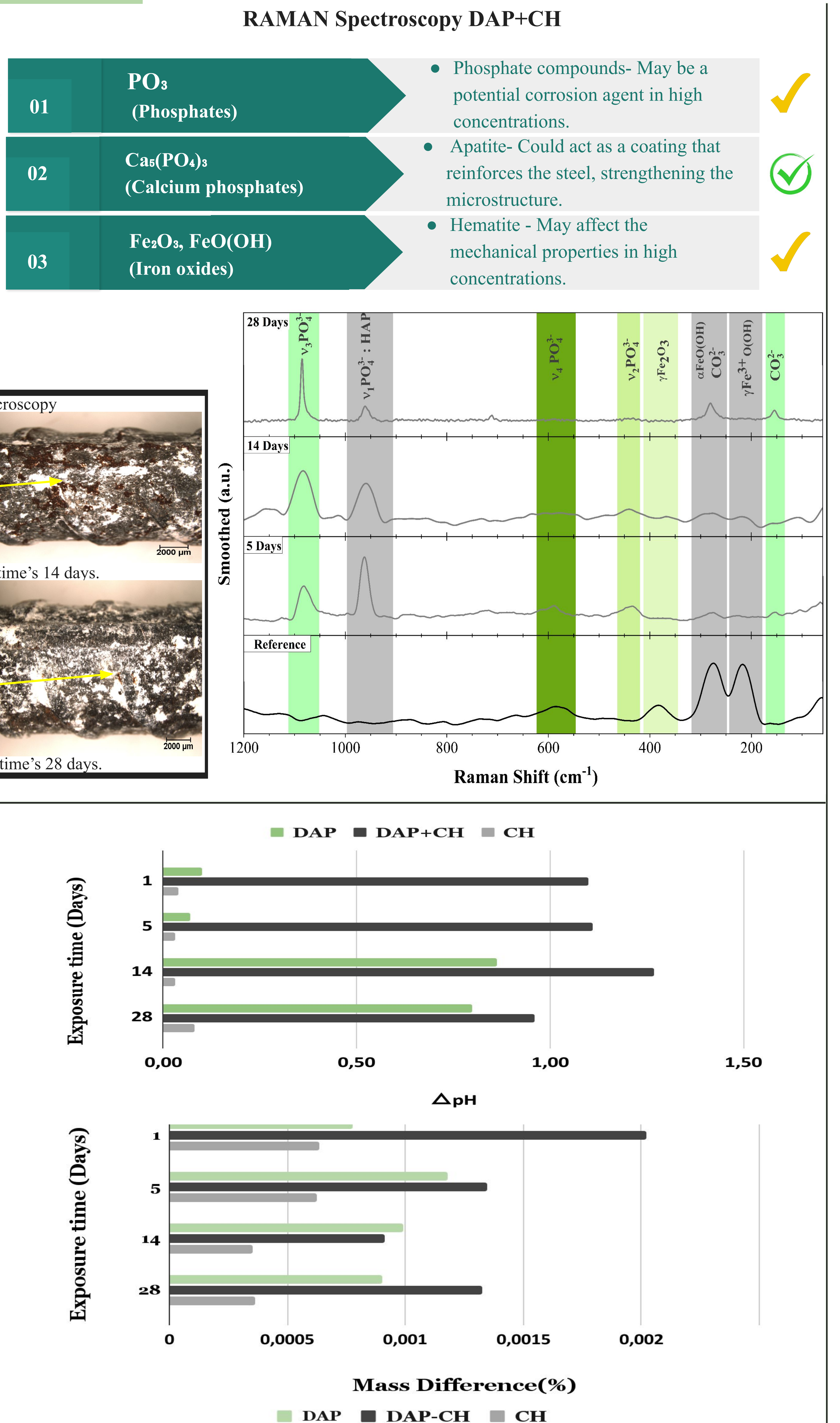
2. METHODOLOGY



4. CONCLUSIONS

- Formation of the expected minerals from calcium phosphates (Apatite family). The minerals that arise from calcium phosphates (Apatite Family) favor the densification of the microstructure and inhibit the corrosion process.
- Phosphate compounds have an use as inhibitors of the corrosion process; however, phosphates in high concentrations could act as an electrolyte, generating pores in the steel and accelerating the corrosion process
- Iron oxides were found, these oxides could work as a protective coat at first; however, depending on the environmental conditions, and their concentration could accelerate the corrosion process.
- Electrochemical impedance spectroscopy analysis is required to see the corrosion rate in the treated RCD mortar-concrete system.

3. RESULTS



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CONTACT INFORMATION

vgalvisv@unal.edu.co Víctor Daniel Galvis Vélez
susmeg@unal.edu.co Santiago Usme Guarín
dgonzalezbe@unal.edu.co Daniela González Betancur
digomezca@unal.edu.co Diana Marcela Gómez Cano
s.meneses1929@pascualbravo.edu.co Sebastián Meneses Munera
ypariasj@unal.edu.co Yhan Paul Arias Jaramillo

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