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# Development and characterization of phosphate glass fibers and their applications

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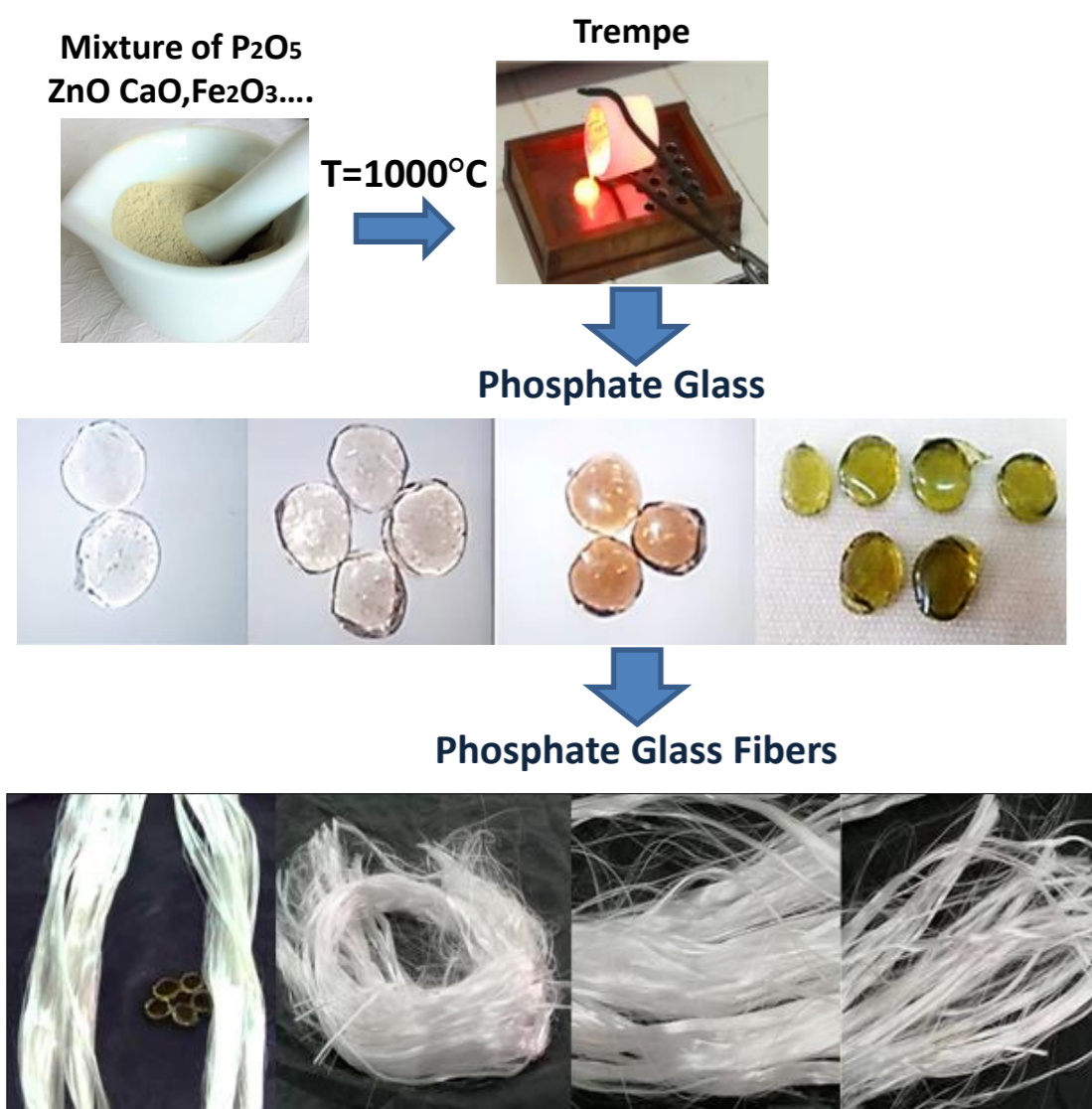
## Abstract

This work focused on the production of high performance phosphate glass fibers (PGF) for various applications, such as soil fertilization and composite materials (automotive, construction, etc...). In this respect, several compositions of spinnable phosphate glasses have been developed. The physical and chemical properties of these fibers have been studied.

## Methodology

### Elaboration of Phosphate glass fibers

Phosphate glasses were prepared by the direct melting method from suitable raw material mixtures:  $P_2O_5$ ;  $ZnO$ ;  $CaO, Fe_2O_3$  and other oxides. The elaborated phosphate glasses were transformed into fibers using the Melt-drawing spinning process.



### Characterization

The chemical durability of elaborate phosphate glass fibers in different pH aqueous mediums was evaluated, The Mechanical properties were determined by a single filament tensile test based on the standard ISO 11566, a single fiber (approximately 11  $\mu m$ ).

## Conclusion and perspectives

The results obtained show that the phosphate glass fibers have a good mechanical properties, flexibility, and homogeneity. The chemical durability of PGF were studied and shows the chemical stability of all developed PGF in different pH aqueous medium (Acid, neutral and basic). These fibers are applied as a fertilizer and as a reinforcement for composite materials

## References

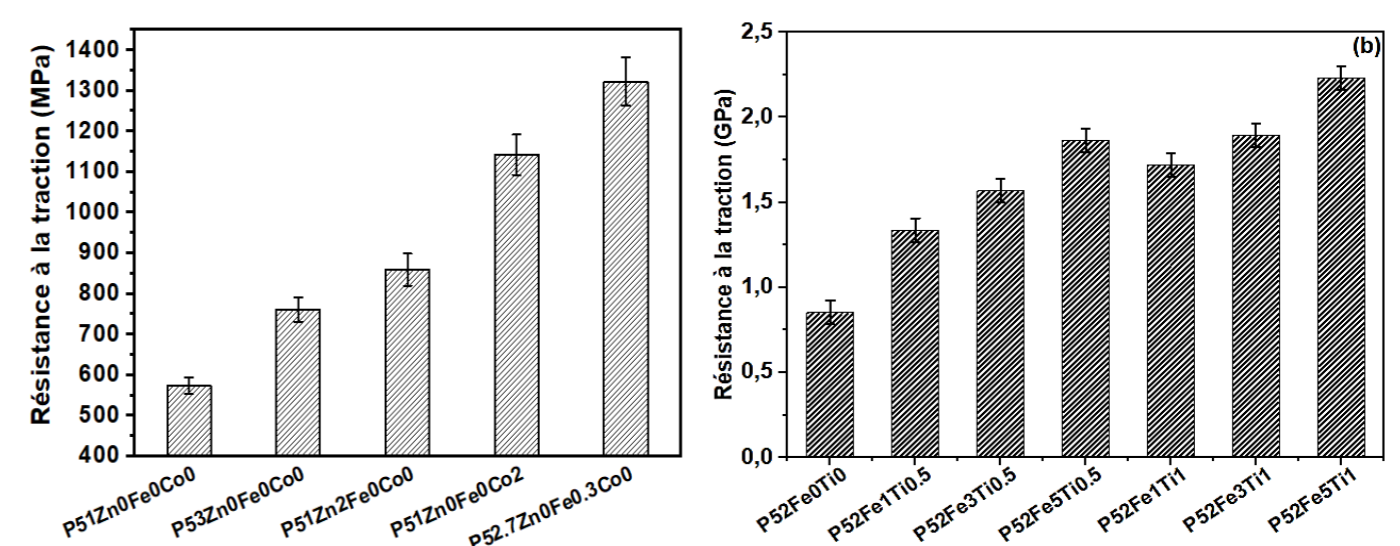
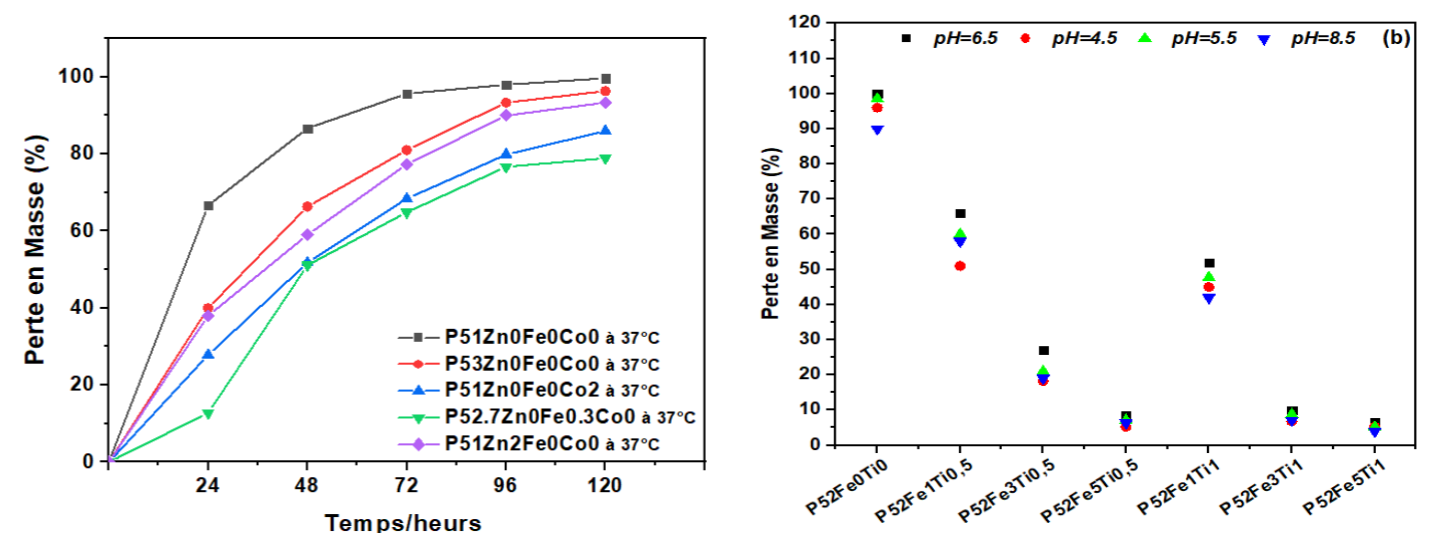
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- [2] K. M. Z. Hossain, M. S. Hasan, R. Felfel, et I. Ahmed, « Development of phosphate-based glass fibers for biomedical applications », Future Medicine, 2014.
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## Context

Les fibres de verre sont classées parmi les fibres à haute performance en raison de leurs propriétés techniques et de performance. Pour cela, leur consommation dans plusieurs industries augmente avec l'accroissement de la population. Le marché mondial de la fibre de verre devrait atteindre 26,70 milliard de dollars d'ici 2027[1]. nowadays PGF are considered a potential substitute for commercial silica-based glass fibers [2,3]

## Result

The study of the mechanical and chemical properties of the elaborated phosphate glass fibers shows their chemical stability in an aqueous medium (fig.1) and their interesting mechanical properties with values up to 2230MPa(fig.2)



### Application (1): Fertilizers fibres



### Application (2): Reinforcement of composite materials

