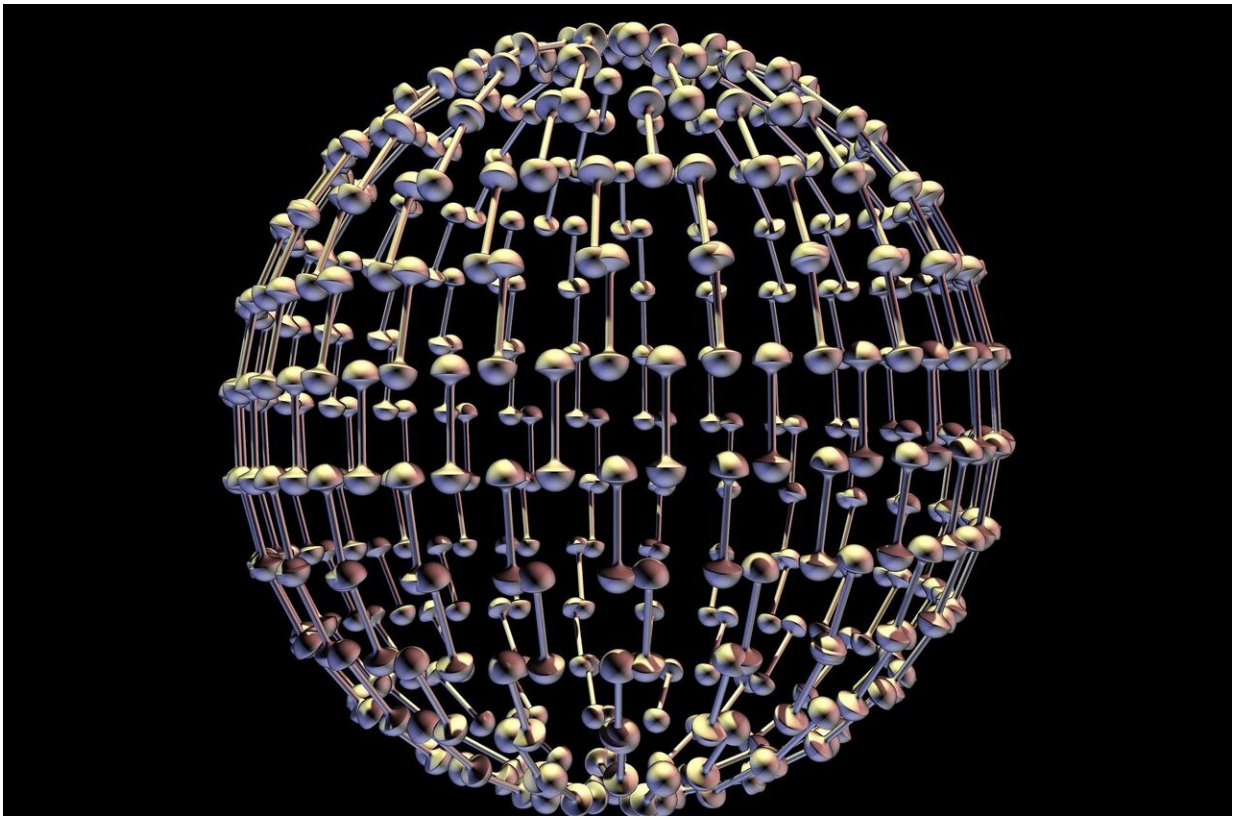


Novel universal principle guides properties of fluorophosphate glass

July 4 2024, by Zhang Nannan



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A research team led by Prof. Wang Pengfei from Xi'an Institute of Optics and Precision Mechanics (XIOPM) of the Chinese Academy of Sciences revealed the relationship between F/O ratio and the structure of

fluorophosphate glass through conducting comprehensive research on Raman spectroscopy and nuclear magnetic resonance (NMR) spectroscopy.

The results were [published](#) in the *Journal of Non-Crystalline Solids*.

The performance of fluorophosphate glass is closely related to its structure. However, the conclusions drawn from all the studies on the structure of fluorophosphate glass so far cannot be universally applied to glasses with different components.

Given that F^- and O^- are the only two existing anions and play a dominant role in the structure, studying the common structural features of glasses based on F/O ratio is an efficient approach.

In this study, researchers prepared a series of glass samples based on the fluorophosphate system with an F/O ratio range of 1 to 7. They studied the content changes of different Q^n groups under different F/O ratio by Raman and NMR spectra. Then, they concluded quantitative relationship between F/O ratio and Q^n characteristics through [comparative analysis](#) of reported NMR spectra.

When the F/O ratio is below 0.3, Q^2 content is highest, while the unit presence of Q^0 is very small, and the percentage is less than 10%. When the F/O ratio is in the range of 0.3 to 1, the Q^n units with the highest content is composed of Q^2 or Q^1 units.

With the increase of the F/O ratio, the content of Q^1 increased significantly, while the content of Q^0 remained relatively stable within this range. When the F/O ratio is in the range of 1 to 4, the Q^n units with the highest content include Q^0 or Q^1 units.

When the F/O ratio is more than 4, the Q^n units with the highest content

are composed of Q^0 . With the increase of oxygen content ratio, the [growth rate](#) of Q^0 slows down and approaches saturation.

This study reveals the general rule of the effect of F/O ratio on the structure of fluorophosphate glass, which provides an effective way to predict the structure and properties of [glass](#) by composition.

More information: Xin Cao et al, Structural insight of fluorophosphate glasses through F/O ratio: Case study of Raman and NMR spectra, *Journal of Non-Crystalline Solids* (2024). [DOI: 10.1016/j.jnoncrysol.2024.123065](#)

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