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Aula QC16

Luminescent sensors for the study of anomalies in the order of water molecules

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Although water is the most studied liquid, the causes of the singularities of most of its properties are not known yet. For instance, the variation of hydrogen bonds characteristics with temperature causes the alteration of the order of water molecules. Consequently, water's properties show anomalous temperature dependencies.

Causes, effects, and influential factors of two of the anomalies of water have been investigated through their effect on the temperature dependence of the luminescence of Eu^{3+} ions, as these ions are excellent sensors of structure changes at the molecular scale.¹⁻³ Moreover, as water is the solvent used for the development of nanomaterials applications in biomedicine, attention has been paid to the effect of water anomalies on nanoparticles.^{4,5}

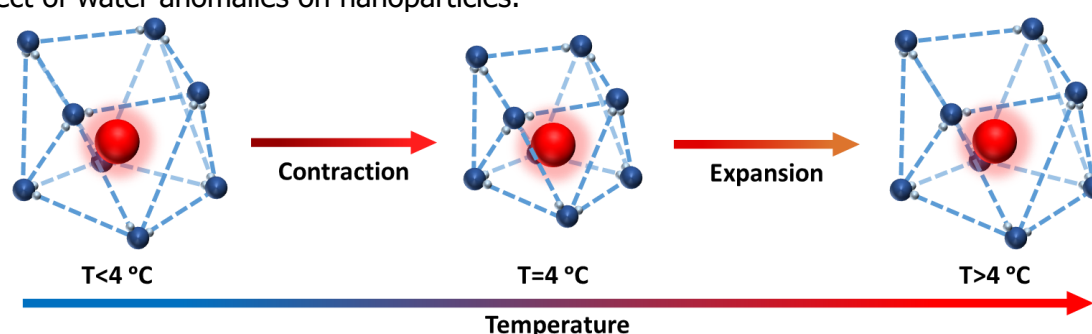


Figure. Variation of hydrogen bonds distance with temperature around the density anomaly temperature.²

- 1 Labrador-Páez, L. *et al.* pH dependence of water anomaly temperature investigated by Eu (III) cryptate luminescence. *Analytical and bioanalytical chemistry* **412**, 73-80 (2020).
- 2 Labrador-Páez, L. *et al.* Eu^{3+} luminescent ions detect water density anomaly. *Journal of Luminescence* **223**, 117263 (2020).
- 3 Labrador-Páez, L. *et al.* Effect of H_2O and D_2O thermal anomalies on the luminescence of Eu^{3+} aqueous complexes. *The Journal of Physical Chemistry C* **122**, 14838-14845 (2018).
- 4 Lu, D. *et al.* Exploring single-nanoparticle dynamics at high temperature by optical tweezers. *Nano Letters* **20**, 8024-8031 (2020).
- 5 Labrador-Páez, L. *et al.* Unveiling molecular changes in water by small luminescent nanoparticles. *small* **13**, 1700968 (2017).