Colorimetric assay for TiO_2 nanoparticles detection in complex matrices as food samples

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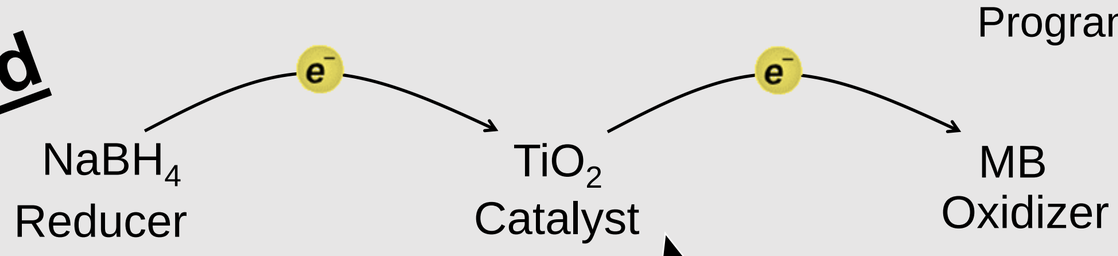
Program: Nanoscience and Nanotechnologies

1. Background



- TiO_2 as aproved food additive can anpear in form of NPs
- Detection of NPs challenging
- Colorimetric assay presents an easy way for detection despite complexity of the sample

In the presence of NPs, methylene blue (MB) is reduced

2. Aim

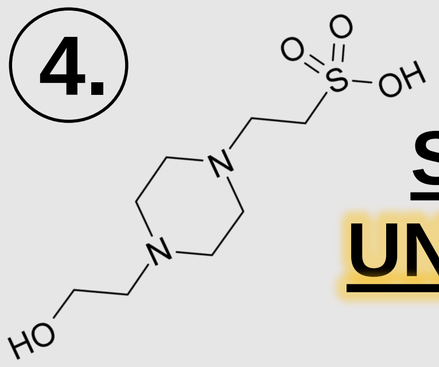
- To adapt method from literature [1] for TiO_2
  - Calibration for food grade TiO_2
    - Crystalinity comparison

3. Optimization

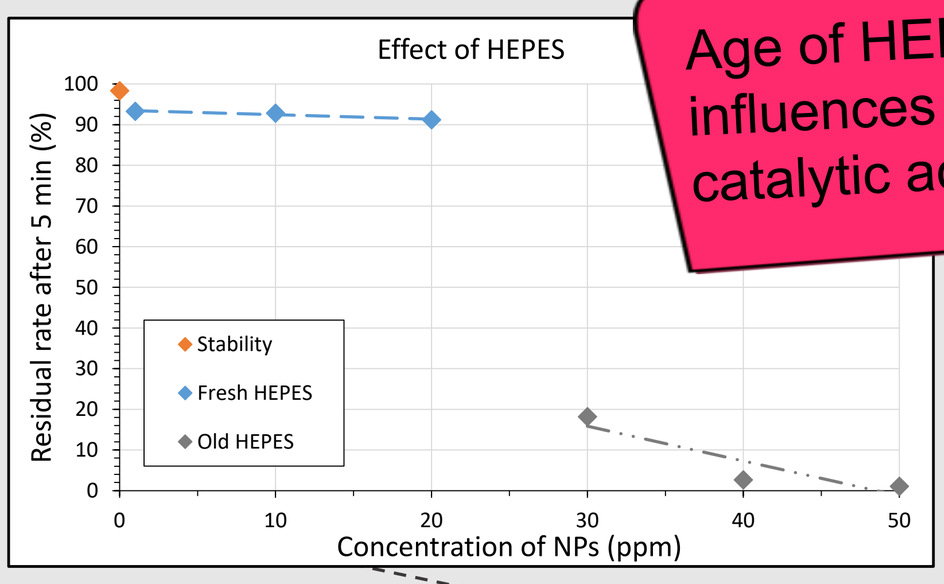
- TiO_2 concentration
- Importance of stirring
- Order of chemicals addition
- Methylene blue concentration
- Buffer

1. 50 ppm
2. No stirring (blue bottle experiment)
3. $NaBH_4$ + HEPES + TiO_2
4. (MB starts reaction)
5. 10 µM
6. HEPES buffer solution

4. Something UNEXPECTED

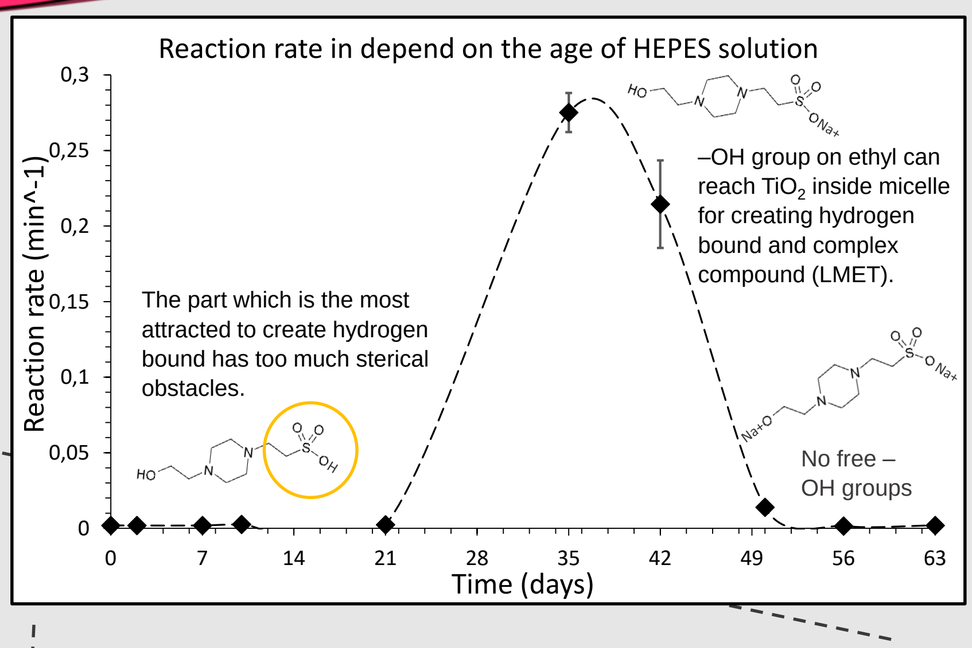


Age of HEPES influences TiO_2 catalytic activity

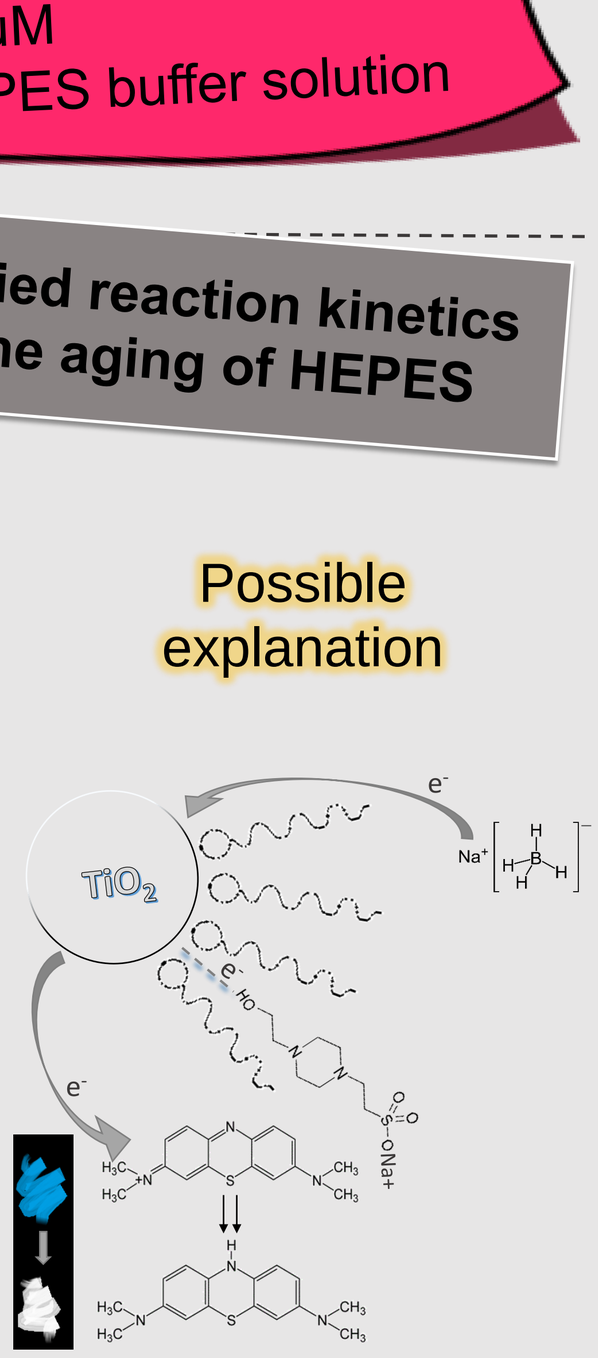


5.

We studied reaction kinetics during the aging of HEPES



Possible explanation



6. Future plans

- To accelerate the kinetics with higher temperature
- FTIR

7. Conclusion

- Method works
- TiO_2 less active than Ag
- All optimized parameters

Literature

[1] Corredor, C., Borysiak, M. D., Wolfer, J., Westerhoff, P., & Posner, J. D. (2015). Colorimetric detection of catalytic reactivity of nanoparticles in complex matrices. Environmental science & technology, 49(6), 3611-3618.

[2] Mallick, K., Witcomb, M., & Scurrell, M. (2006). Silver nanoparticle catalysed redox reaction: an electron relay effect. Materials Chemistry and Physics, 97(2).

[3] Jana, N. R., Wang, Z. L., & Pal, T. (2000). Redox catalytic properties of palladium nanoparticles: surfactant and electron donor-acceptor effects. Langmuir, 16(6).

[4] Xiao, X., Zhu, W-W., Lei, Y-B., Liu, Q-Y., & Li, W-W. (2016). Zwitterionic buffer-induced visible light excitation of TiO_2 for efficient pollutant photodegradation. The Royal Society of Chemistry, Advances, 6.

Acknowladges

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