FLUORESCENT COMPOUNDS PRESENT IN FOOD

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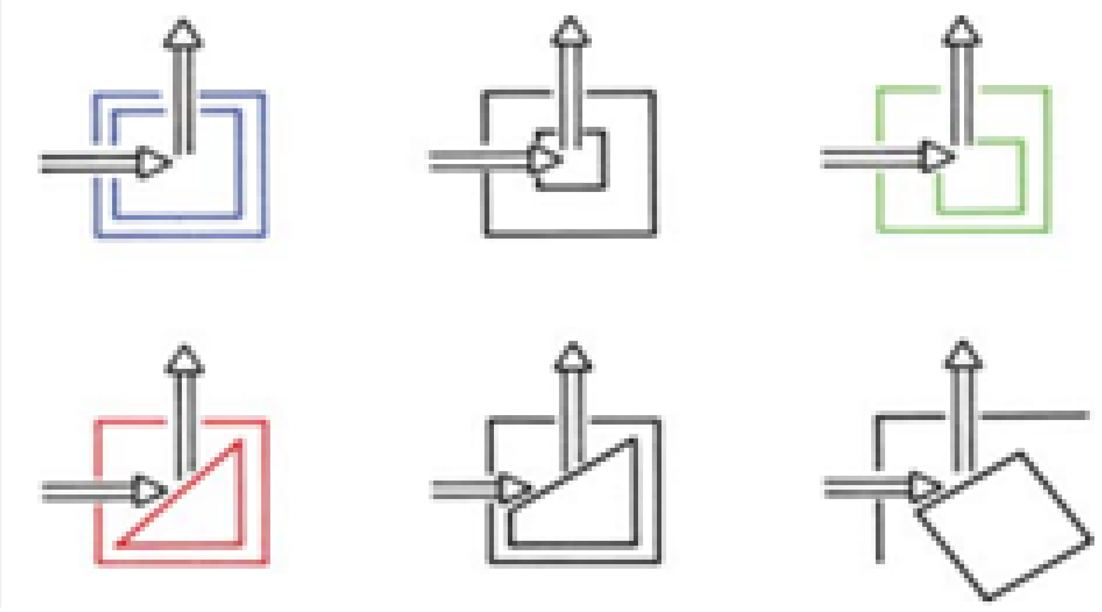
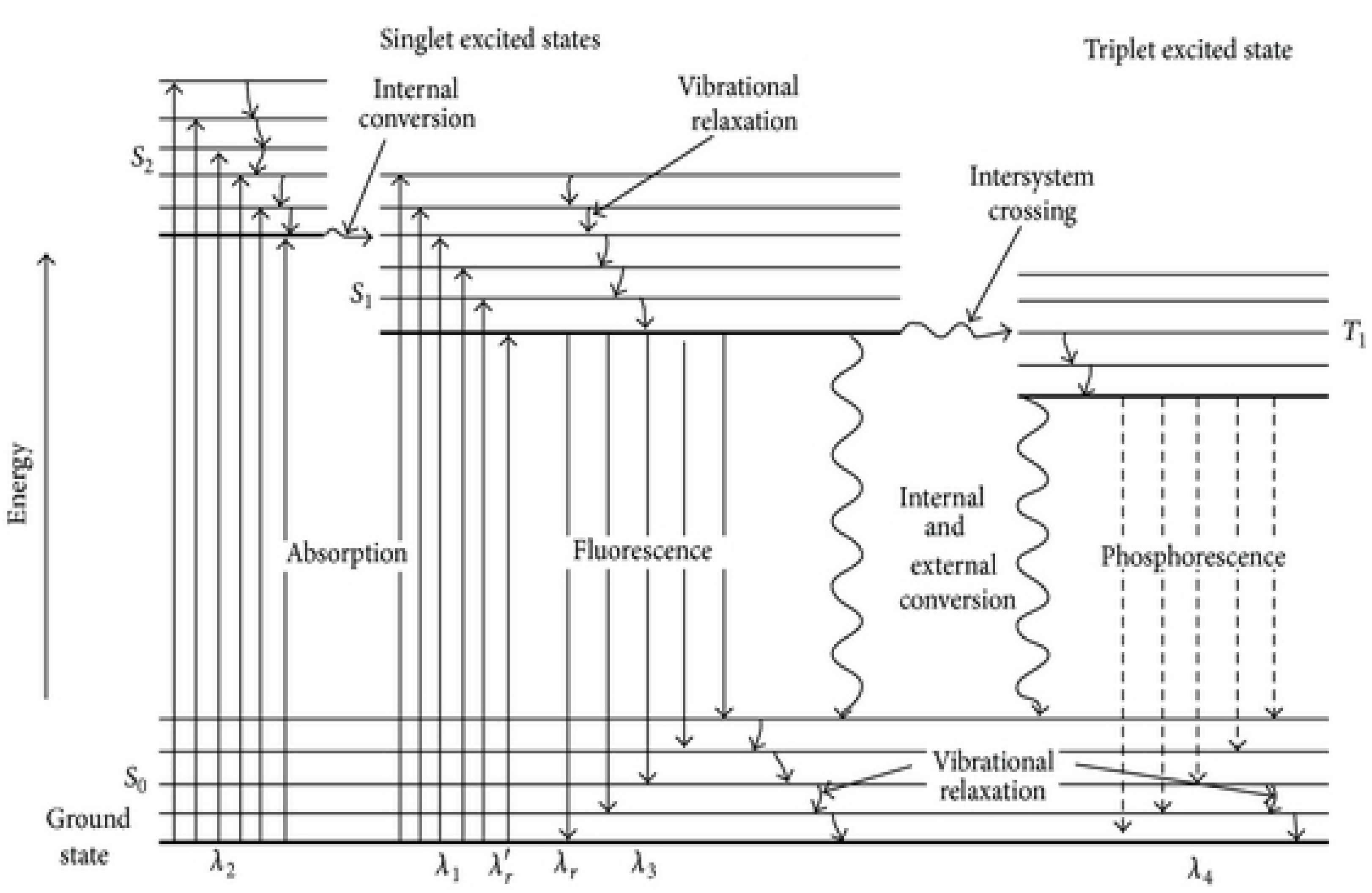
INTRODUCTION

The food industry demands fast, reliable, cheap and reproducible methods for quality and process control. This bibliographic review work investigates florescence spectroscopy, a method that couldn't be used in food until the recent technological advances, concretely front-face fluorescence and chemometric tools. This technology presents advantages as compared to classical methods like HPLC or capillary electrophoresis, which require qualified staff, sample preparation and are time-consuming.



The **aim** of the present work is to collect the necessary information to understand the fluorescence phenomena and identify the principal fluorescent components present in food and their possible applications. A second aim is to give an overview of the experiments carried out until now.



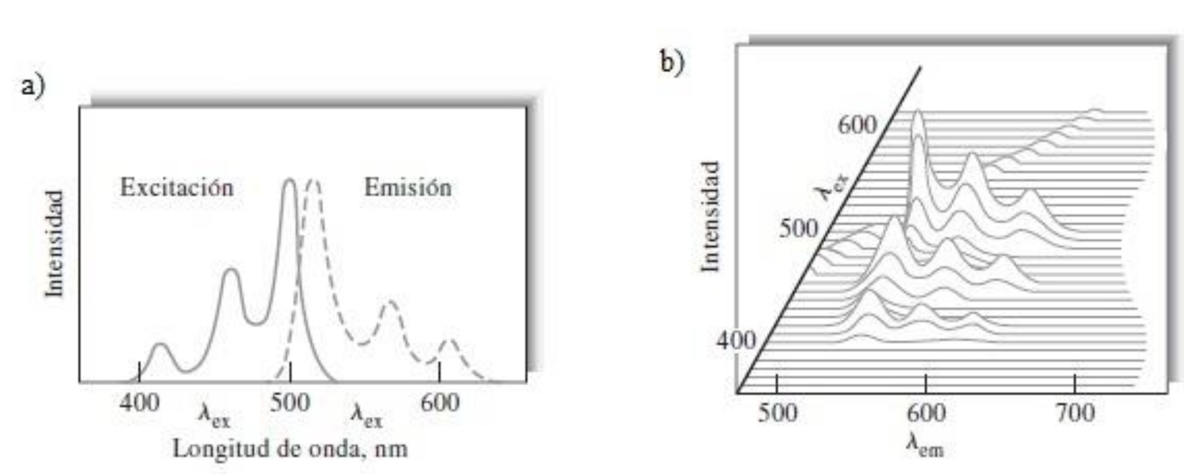
FLUORESCENCE

- Three stage phenomena:
  1) Fluorophore is excited by absorption of an external photon
  2) Excited state interacts with its environment and undergoes conformational changes
  3) A photon is emitted at a longer wavelenght (return to ground state)

- Measurements with a fluorometer or spectrofluorometer
- Short time measurements but very sensitive to interferences

METHODOLOGY:

- Internet
- Databases: Pubmed, Science Direct, Trobador + …
- Total documents used: 35
- Keywords: *fluorescence, fluorescence spectroscopy, endogenous fluorophores, front-face fluorescence, chemometrics*.



Fluorophore	Concentration [M]	Excitation λ_{max} [nm]	Emission λ_{max} de [nm]	Measuring range (excitation/emission) [nm]
Tryptophan	10^{-5}	230 y 276	355	230-310 / 230-450
Tyrosine	10^{-5}	278	302	230-310 / 230-450
Phenylalanine	10^{-3}	262	281	230-310 / 230-450
NADH	10^{-4}	338	465	260-460 / 380-590
ATP	10^{-3}	292	392	260-320 / 320-500
Riboflavin (Vit. B_2)	10^{-5}	268, 372 y 444	528	250-500 / 480-590
Pyridoxin (Vit B_6)	10^{-5}	326	396	220-360 / 350-470
Retinol (Vit. A)	10^{-5}	328	484	260-380 / 400-620
Tocopherol (Vit. E)	10^{-4}	298	323	220-320 / 290-380
Clorophyll A	10^{-6}	428	663	350-650 / 640-690
Hematoporphyrin	10^{-5}	394	613	300-550 / 590-690

FLUOROPHORES PRESENT IN FOOD:

Food/ Fluorophore	Milk and Dairy products	Edible oils and fats	Meat and meat products	Fish and fishery products	Alcoholic beverages	Fruits, vegetables and juices	Eggs	Pastry, honey and sugars
Aromatic amino acids	Delineation of the structure of soft cheeses at the molecular level. Characterization of mild heat treatments applied to milk. Investigation of coagulation of milk. Evaluation of fluorophores as tracers for curd syneresis	Detection of milk fat adulteration with vegetable oil	Characterization of beef muscles. Monitoring of the texture of meat emulsions and frankfurters	Monitoring of fish freshness. Differentiating between fresh and frozen-thawed fish	Classification of brandies and wine distillates		Assessing egg freshness during storage	Monitoring lipid oxidation in cakes. Authentication of botanical and geographical origin of honey
Riboflavin	Light-induced oxidative changes in model dairy spread. Wavelenght dependence in light-induced oxidation. Controlling light-oxidation flavour. Rapid analysis of riboflavin in yogurt. Evaluation of fluorophores as tracers for curd syneresis	Detection of milk fat adulteration with vegetable oil						
Porphyrins	Light-induced oxidative changes in model dairy spread. Wavelenght dependence in light-induced oxidation. Controlling light-oxidation flavour.		Detection of fecal contamination with dietary porphyrins. Characterization of beef muscles					
Clorophyll	Light-induced oxidative changes in model dairy spread. Wavelenght dependence in light-induced oxidation. Controlling light-oxidation flavour.	Classification of edible oils. Characterization of edible oils			Characterization of ripening of Cabernet Franc grapes			
Polyphenols		Classification of edible oils. Characterization of edible oils			Classification of brandies and wine distillates Characterization of ripening of Cabernet Franc grapes	Detection of orange juice frauds		Authentication of botanical and geographical origin of honey

CONCLUSIONS

- Fluorescence spectroscopy methods coupled with chemometrics are potent tools for process and quality control in the food industry and food science research.
- Tremendous potential for development of on-line or in-line sensors.
- An excellent calibration is required for the methods.

FUTURE TRENDS:

- Better chemometric tools.
- More matrixes and applications.
- On-line and in-line application in industry.