Electronic Supplementary Information

Determination of Riboflavin Based on Fluorescence Quenching by Graphene Dispersions in Polyethylene Glycol

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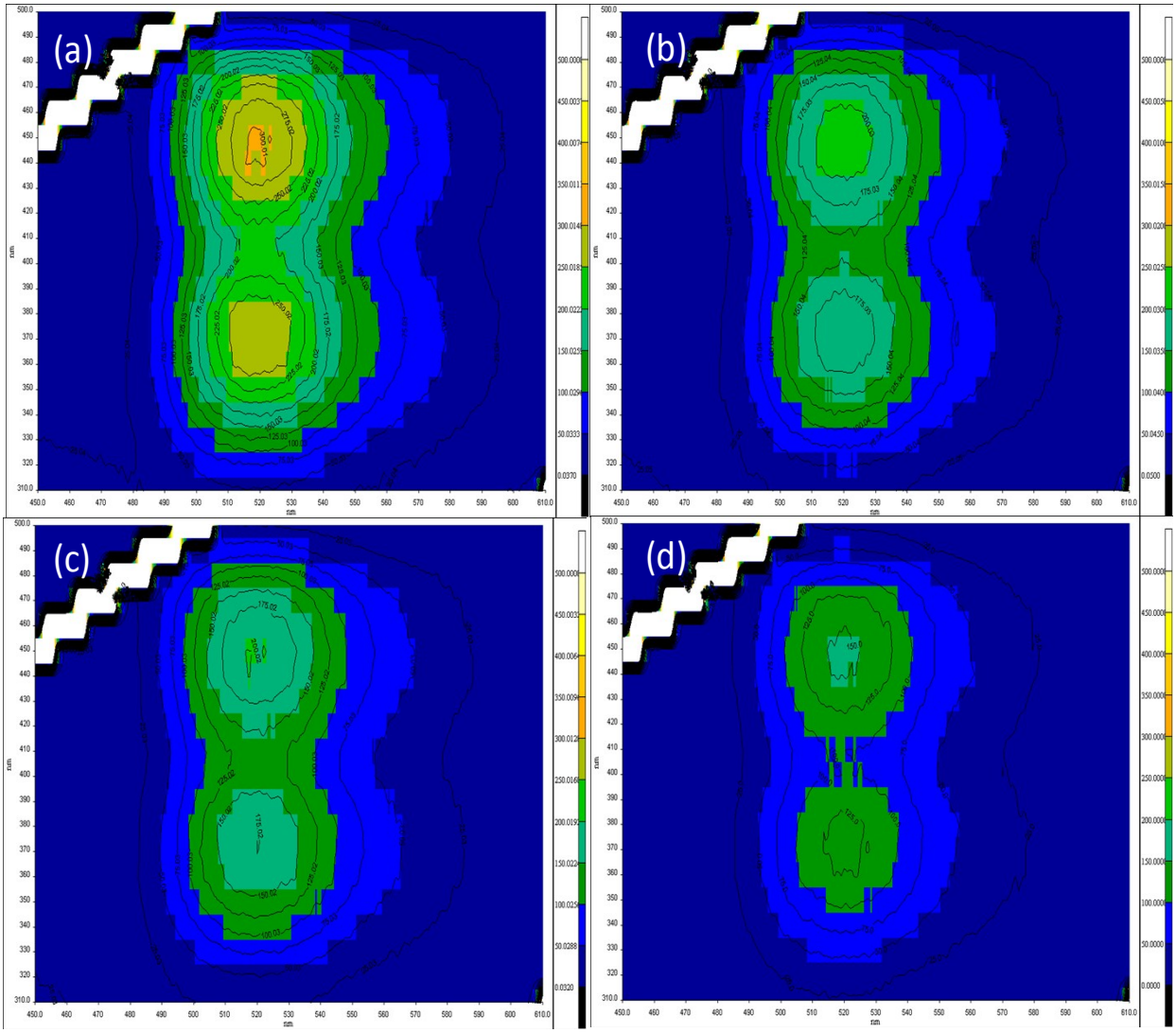

Figure S1. Fluorescence contour graphs of vitamin B_2 in the presence of G (0.1 wt.%) dispersions in PEG (0.25 mM) for an ultrasonication power of 320 W and times of 1.0 (a), 2.0 (b), 5.0 (c) and 10.0 (d) min.

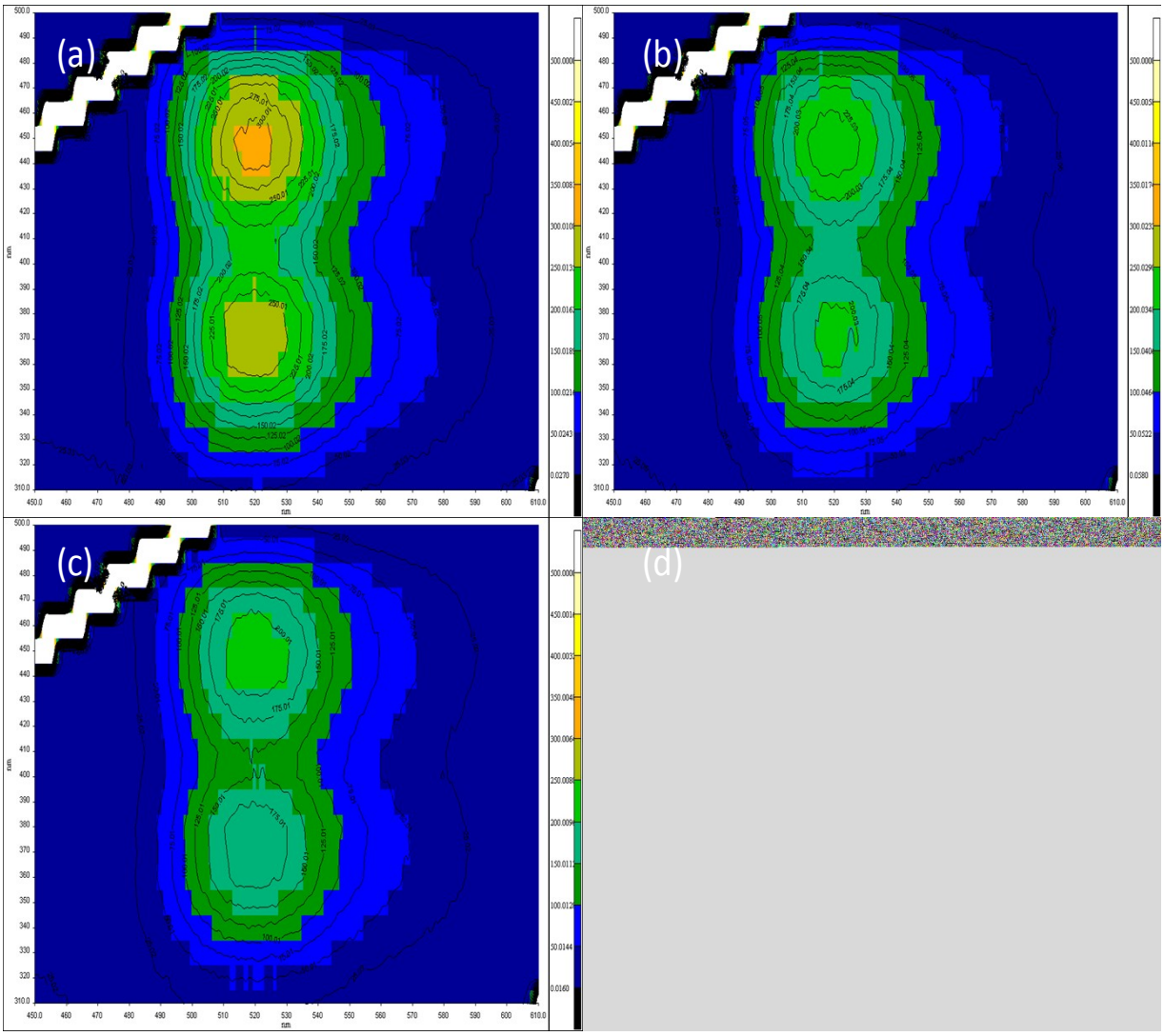

Figure S2. Fluorescence contour graphs of vitamin B_2 in the presence of G (0.1 wt.%) dispersions in PEG (0.25 mM) for an ultrasonication time of 5 min and powers of 80 (a), 160 (b), 240 (c) and 320 (d) W.

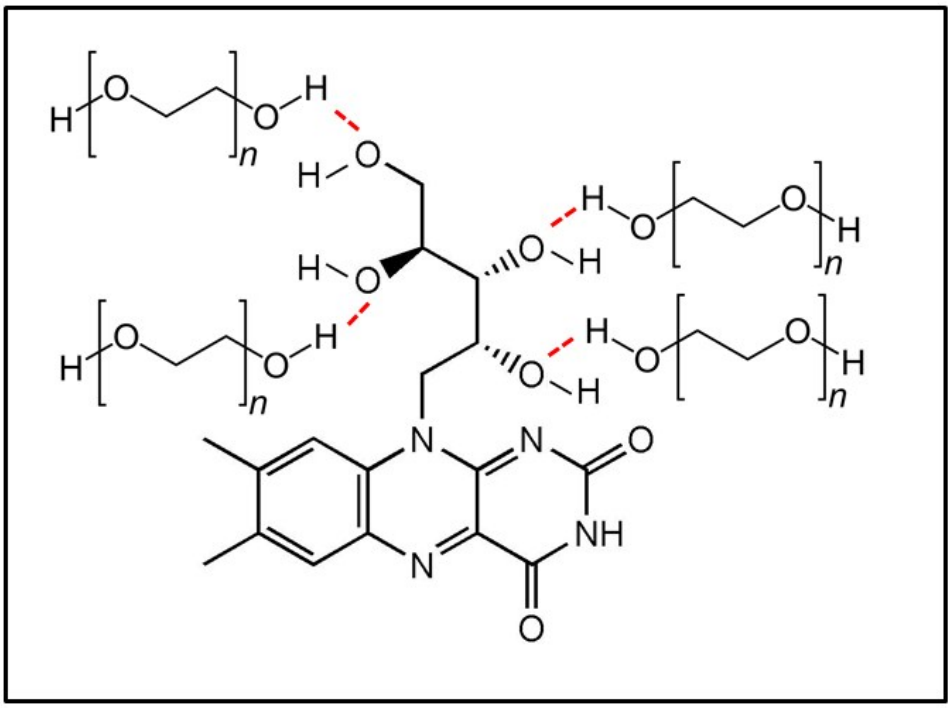

Fig. S3. Schematic representation of the H-bonding interactions between the four hydroxyl moieties of the ribityl chain of riboflavin and PEG.

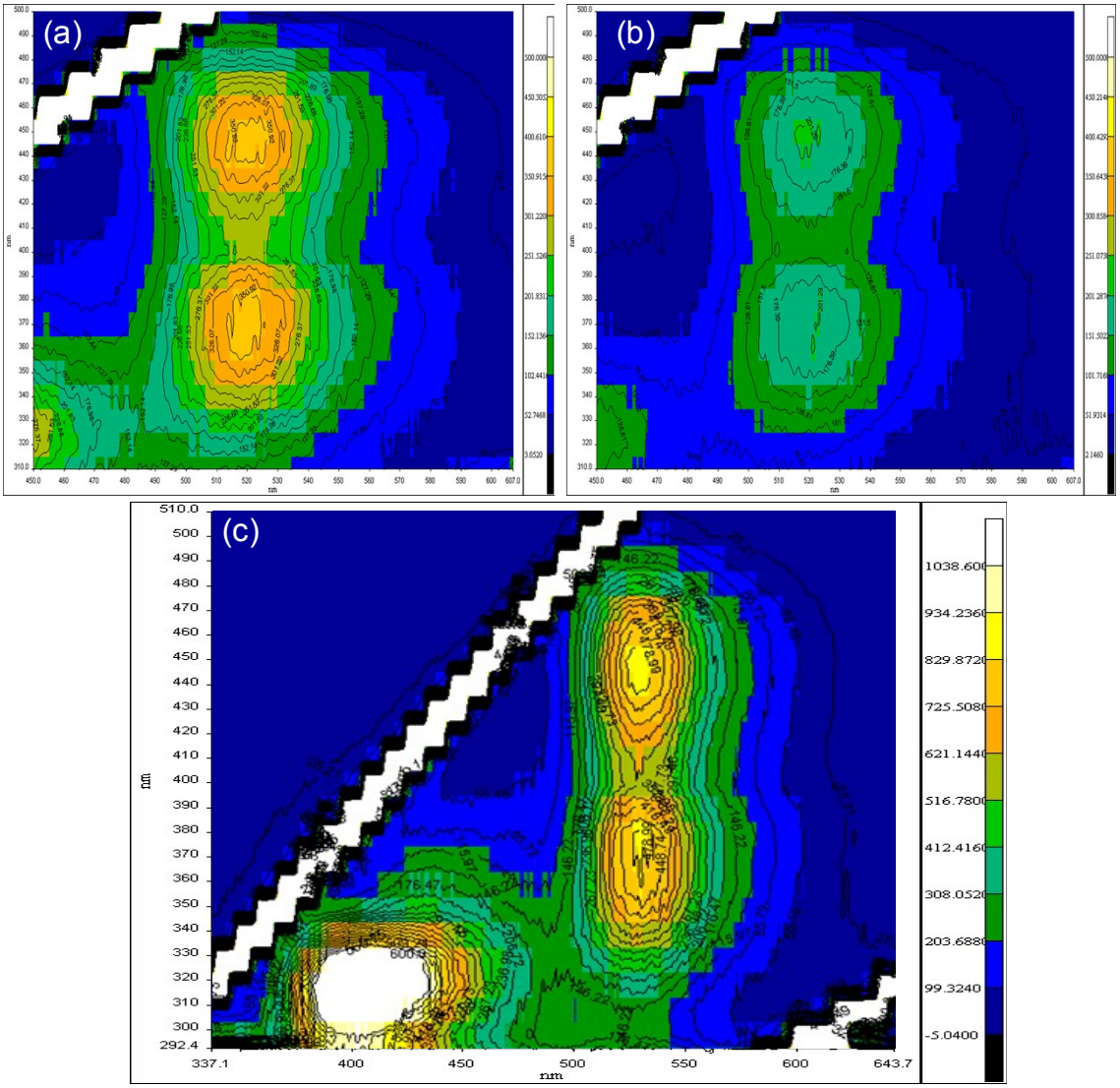

Figure S4. Fluorescece contour graphs of commercial multivitamin tablets in PEG (0.25 mM) (a) and G (4.0 wt%) dispersions in PEG (0.25 mM). (c) Whole fluorescence spectrum of the commercial tablets in PEG (0.25 mM). As can be observed, the other components of the sample (vitamins A, E, C, K, D, B_1, B_6 and B_{12}, biotin, folic acid, niacin, and pantothenic acid) do not interfere with the determination of vitamin B_2.

Table S1. Comparison of the analytical features of different methods reported for the determination of vitamin B_2.

Matrix	Method	Recovery (%)	RSD (%)	LOD/LOQ	Ref.
whey, milk, buttermilk	FLU, pH = 7.0	95–102	NA	NA	(1)
pharmaceutical samples	FLU, λ_{ex}= 450nm	NA	0.7	30 μg L^{-1}/ NA	(2)
pharmaceutical samples	SFS in AOT micelles, Δλ= 74 nm	NA	1.3	9 μg L^{-1}/ NA	(2)
multivitamin tablet	Quenching of FLU with G in PEG λ_{ex}= 310 nm	96.5	1.5–3.1	0.03 μg mL^{-1}/ 0.1 μg mL^{-1}	This work
cereals, vitamin tablets	LED-IF in surfactants, λ_{ex}= 450-500nm	91.3–100	~2	NA / 0.2 μg mL^{-1}	(3)
—	FRET□, λ_{ex}= 320 nm, pH = 4	NA	NA	0.6 μg mL^{-1}/ NA	(4)
milk, vitamin drink	FRET□, λ_{ex}= 340 nm, pH =7. 4	98–118	NA	170 nM/ NA	(5)
powdered infant milk	HPLC + UV-Vis	> 96	3.3	0.1 μg mL^{-1}/ 0.25 μg mL^{-1}	(6)
baby food, cereals, fruit	RP-HPLC + UV-Vis	70.3	1.6	0.03 μg mL^{-1}/ NA	(7)
baby food, milk, cereals	RP-HPLC + FLU, λ_{ex}= 422 nm	>89	5–13	NA	(8)
beef, pork loin, pig liver.	RP-HPLC + FLU, λ_{ex}= 450 nm	89.5	<5.0	< 1.35 mg kg^{-1}	(9)
milk, baby formula, liver, pork, broccoli, flour	RP-HPLC + FLU, λ_{ex}= 468 nm	77–81	4.7	0.003 μg mL^{-1}/ 0.1 mg kg^{-1}	(10)
urine	ILC	>87.5	<9.0	40 ng mL^{-1}/ NA	(11)
pharmaceutical samples	MLC + UV-Vis	NA	<3.3	3 ng mL^{-1}/ NA	(12)
urine, pharmaceutical samples	UV-Vis	94.8 – 103.7	1.5–5.8	0.2 ng mL^{-1}/ NA	(13)
soybean meal, cereals	Microbiological assay with *L. rhamnosus*	NA	4–16	NA	(14)
milk infant formulae	Biosensor assay using Biacore Kits	103.6	1.73	0.85 μg g^{-1}/ NA	(15)
milk-based products	Biosensor assay based on SPR	NA	<5.0	70 μg L^{-1}/ 234 μg L^{-1}	(16)
beverage, tea, urine	CE + LIF	94.3–105	1.9–4.5	3.0 nM / NA	(17)
wine, milk, yoghurt, eggs	CE + LIF	>90.0	2.6	0.5 μg L^{-1}/ NA	(18)
mammalian cells	CE+ LED-IF□, λ_{ex}= 450-500 nm	96.0	≤ 6.0	3.8 nM / 11 nM	(19)
urine	CE+ LED-IF, λ_{ex}= 450-500 nm	NA	NA	20 ng mL^{-1}/ NA	(20)

NA: non-available; FLU: fluorescence; SFS: synchronous fluorescence spectrophotometry; AOT: bis-2-ethylhexysulfosuccinate sodium salt; LED-IF: LED-induced fluorescence detection; FRET: fluorescence resonance energy transfer; HPLC: high-performance liquid chromatography; UV-Vis: ultraviolet-visible spectrophotometry; RP-HPLC: reverse-phase HPLC; ILC: isocratic liquid chromatography; MLC: micellar liquid chromatography; SPR: surface plasmon resonance; CE: capillary electrophoresis

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