**Supplementary information**



Figure S1: Chemical structure of lutein (a) and L-ascorbic acid (b).



Figure S2: Spectrum of the Siemens HBO 75W – XBO 100W lamp, used for artificial illumination of lutein-zein particle dispersions.

Table S1: Particle sizes (Intensity averaged) of Z, LZ, ZA, and LZA dispersions measured directly after dialysis, and measured after 7 days after dialysis (Z = zein, LZ = lutein-zein, ZA = zein-AA, LZA = lutein-zein-AA).

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| --- | --- | --- |
| sample | Particle diameter (nm)after dialysis  | Particle diameter (nm)7 days after dialysis |
| Z | 102.9 ± 44.6 | 127.1 ± 68.4 |
| LZ  | 106.3 ± 46.2 | 111.6 ± 49.9 |
| ZA | 129.7 ± 72.3 | 231.5 ± 82.4 |
| LZA  | 119.5 ± 61.2 | 237.1 ± 125.7 |

|  |  |
| --- | --- |
| a) | b) |
| c) | d) |
| e) |  |

Figure S3: UV-vis spectra corresponding to the data in Figure 5. Effect of exposure to light on the concentration of lutein over time for (a) the lutein reference, (b) a dispersion with 2.5 wt% zein concentration, (c) a dispersion with 3.5 wt% zein concentration, (d) a dispersion with 5.5 wt% zein concentration, and (e) a dispersion with 6.5 wt% zein concentration. All particle dispersions were prepared using an initial amount of 0.010 wt% lutein (including the reference).

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|  |
| a) | b) |
| c) | d) |

Figure S4: Corresponding UV-vis spectra of Figure 6, lutein content of Lutein-zein particle dispersions and reference placed in a dark room after illumination by a Siemens HBO 75W – XBO 100W lamp. UV-vis spectra over time for (a) the lutein (L) reference, (b) lutein and AA (LA) reference, (c) a dispersion with 2.5 wt% zein concentration and lutein (LZ), and (d) a dispersion with 2.5 wt% zein concentration, lutein and AA (LZA).

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| a) | b) |
| c) | d) |

Figure S5: Corresponding UV-vis spectra for Figure 7, Lutein-zein particle dispersions and references samples placed in the windowsill and illuminated by daylight (October until April). UV-vis spectra over time for (a) the lutein (L) reference, (b) lutein and AA (LA) reference, (c) a dispersion with 2.5 wt% zein concentration and lutein (LZ), and (d) a dispersion with 2.5 wt% zein concentration, lutein and AA (LZA).