Supplementary Information for “Direct evidence for metallic mercury causing photo-induced darkening of red cinnabar tempera paints”

Supplentary Fig.1. FESEM images of unaltered and UV-aged cinnabar pigment. a) unaltered cinnabar pigment grains, b) cinnabar pigment after 2 months of UV aging showing grains with extensive crack formation (arrows), c) UV-aged grains partially covered by schuetteite (arrows), and d) detail of the UV-exposed pigment surface showing HgSO₄·H₂O and schuetteite.
Supplementary Fig. 2. XRD patterns of unaltered and UV-exposed cinnabar paint. Gp = gypsum. Gth = goethite, ZS = zinc sulfate, and Cin = cinnabar (Mineral abbreviation, except zinc sulfate, according to Whitney and Evans (Am. Mineral. 95, 185-187 (2010)).

Supplementary Fig. 3. Contact angle measurement of a 3 µl mercury droplet on a polished cinnabar surface using the sessile drop method (OCA 15EC, DataPhysics Instruments, Germany).
Supplementary Fig. 4. UV-Vis spectrum of egg yolk revealing important absorption for $\lambda \leq 550$ nm.

Supplementary Table 1. Normalized elemental concentrations (wt%) based on $\mu$-XRF mapping.

| Sample  | Hg   | S    | Mg | P  | Ca  | K   | Na | Fe | Ba  |
|---------|------|------|----|----|-----|-----|----|----|-----|
| Pigment | 84.26| 11.71| 0.26| 0  | 1.91| 0.02| 0  | 0.28| 1.56|
| Paint   | 82.96| 11.59| 0.04| 1.49| 1.35| 0.53| 0.37| 0.12| 1.55|

Supplementary Table 2. Crystallite size (nm) for different $hkl$ Bragg peaks of cinnabar pigment before (control) and after UV aging (UV-exposed)

| Sample       | 102 | 110 | 111 | 014 | 201 | 113 |
|--------------|-----|-----|-----|-----|-----|-----|
| Control      | 51  | 37  | 35  | 38  | 33  | 33  |
| UV-exposed   | 46  | 34  | 31  | 34  | 31  | 30  |