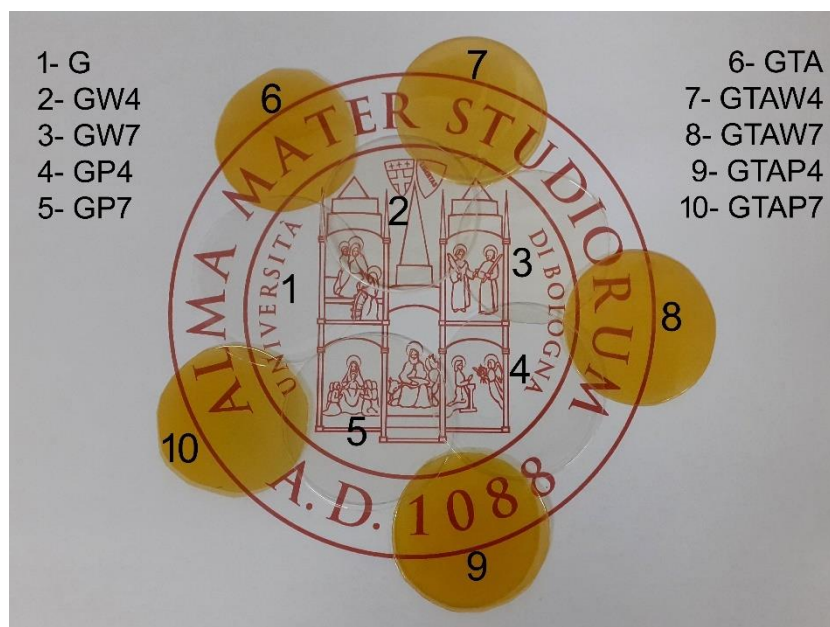


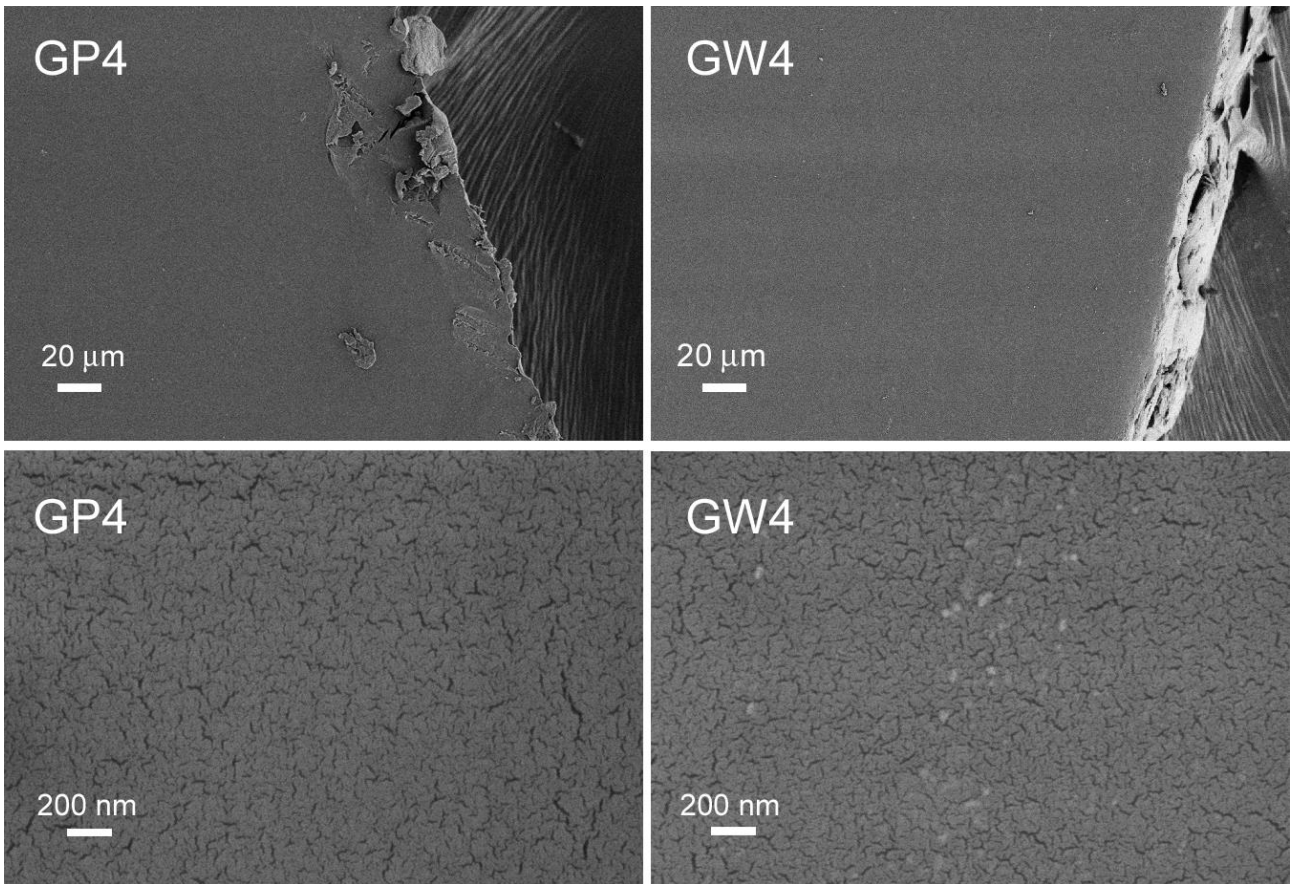
## Supplementary Materials

### The role of $\text{WO}_3$ nanoparticles on the properties of gelatin films

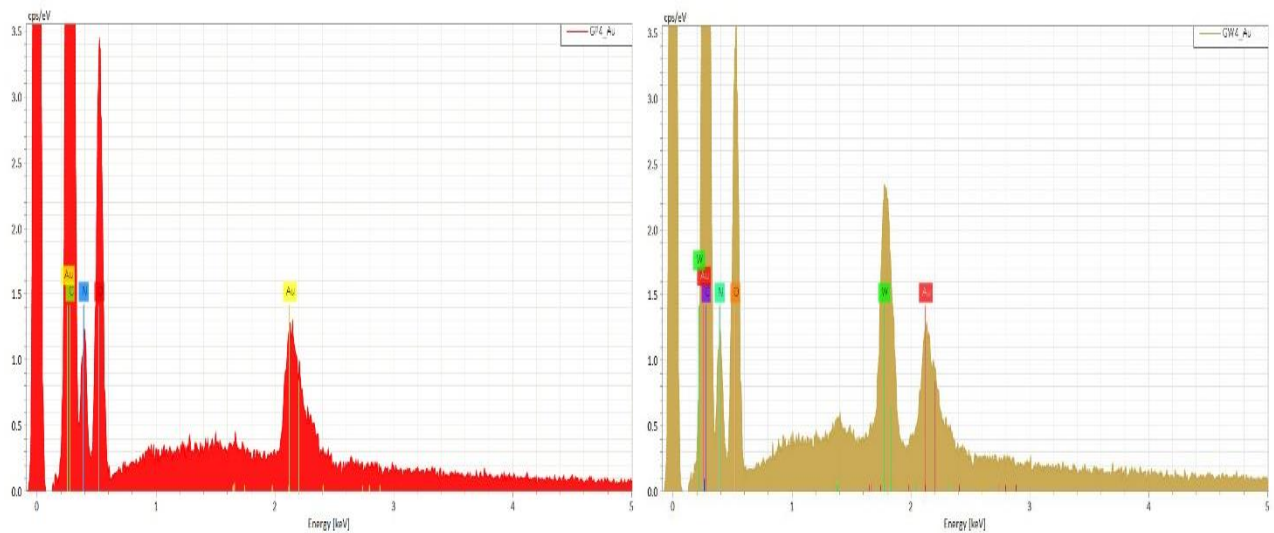
Katia Rubini, Arianna Menichetti, Maria Cristina Cassani, Marco Montalti,  
Adriana Bigi, Elisa Boanini



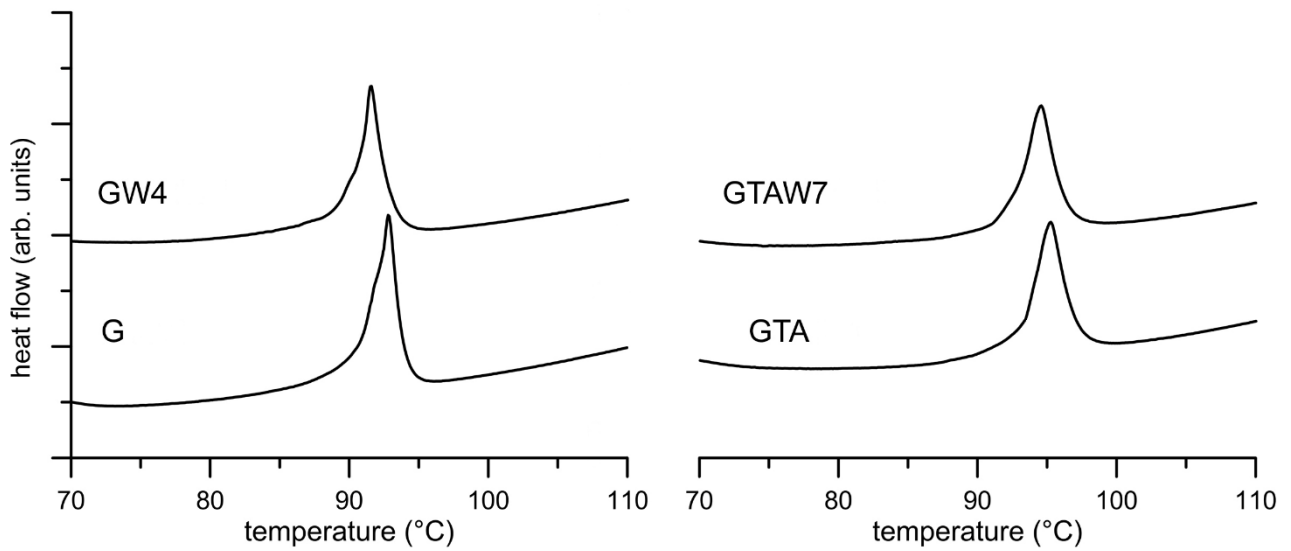
**Figure S1** - Photographs of gelatin films showing the different colors due to  $\text{WO}_3$  nanoparticles and/or crosslinking with glutaraldehyde solution.



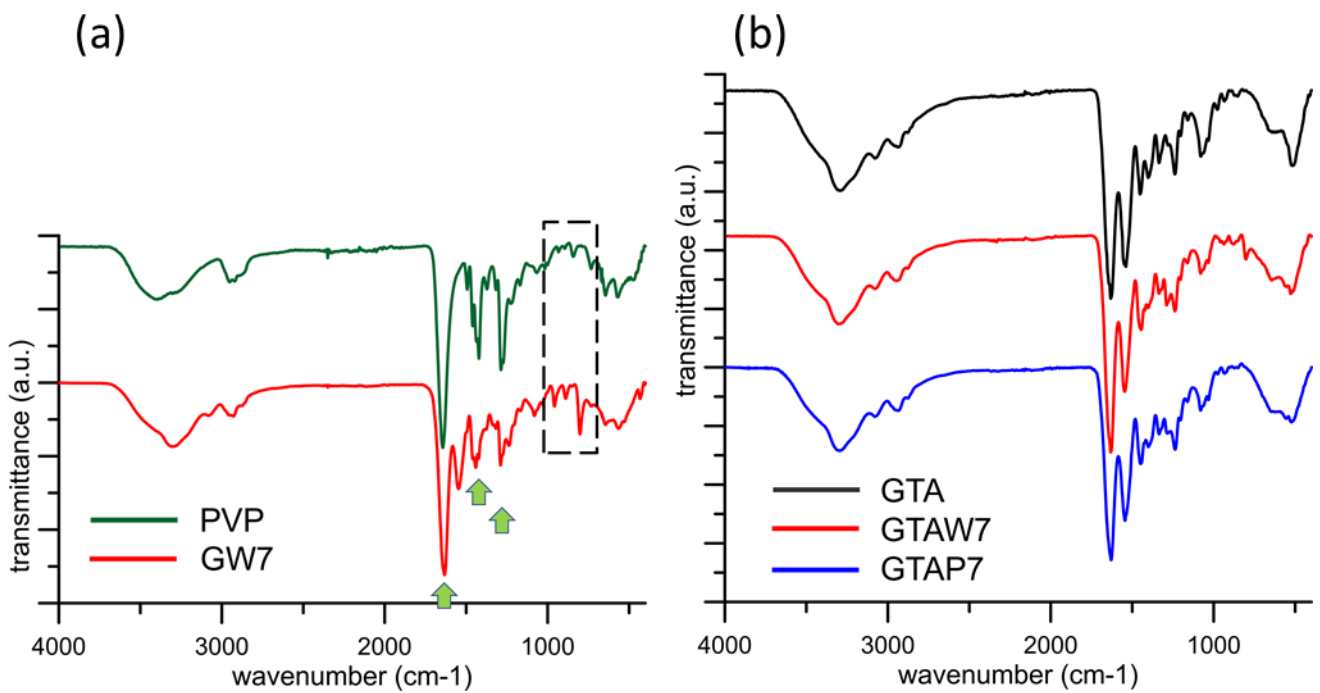
**Figure S2** - FEG-SEM morphological investigation reveals the presence of aggregates of nanoparticles on the surfaces of gelatin films containing  $\text{WO}_3$ . The high-magnification images (100,000x) show the presence of sputtered gold.



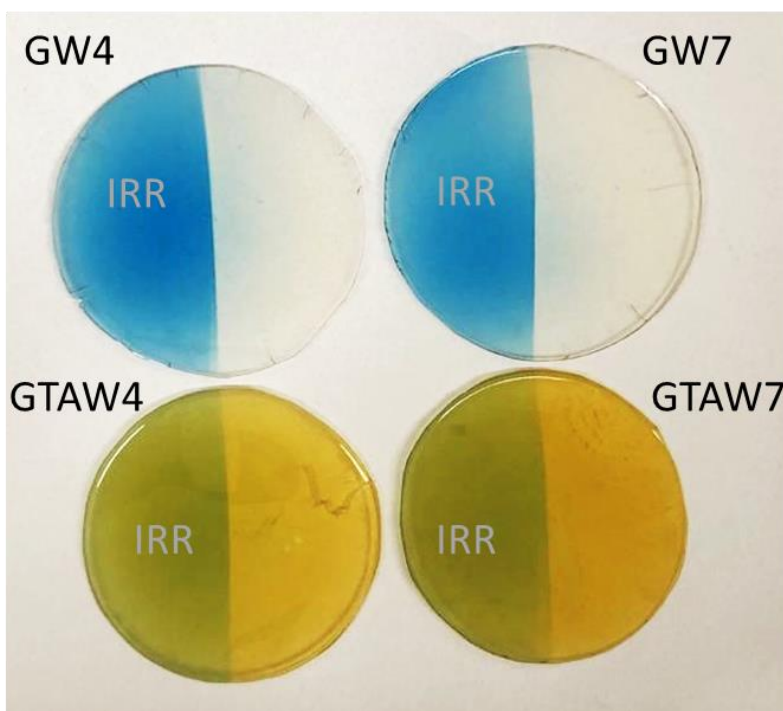
**Figure S3** – EDS spectra of GW4 ( $\text{WO}_3$  loaded, on the left) and GP4 (unloaded, on the right) films.



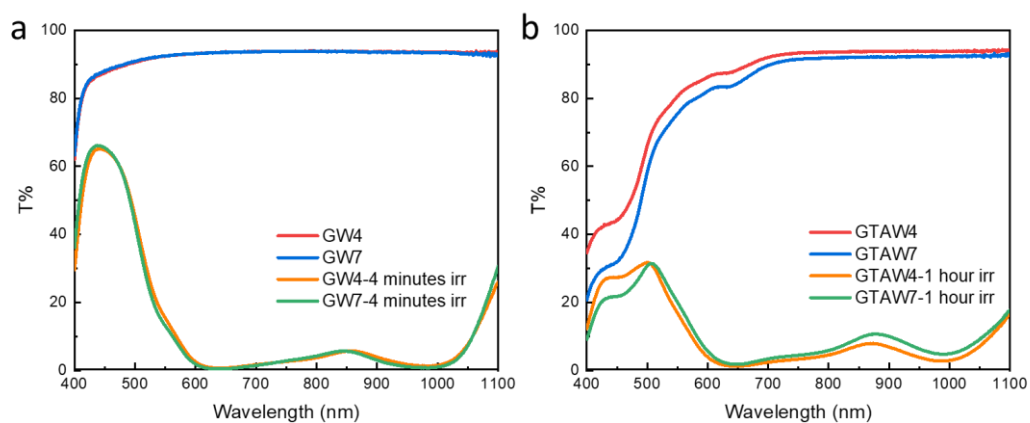
**Figure S4** - DSC thermograms recorded from G films and GTA films show the presence of an endothermic peak due to collagen triple helix denaturation



**Figure S5** - FT-IR spectra collected in ATR mode: (a) comparison between GW7 and pure PVP; (b) selected crosslinked films. Green arrows indicate the absorption bands due to the presence of PVP ; dashed line indicates the absorption bands due to the nanoparticles.



**Figure S6** - Gelatin films photochromic effect. The left part of every sample has been irradiated with a LED at 365 nm (irradiance 80 W/m<sup>2</sup>) for 20 seconds.



**Figure S7** - Gelatin films photochromic effect efficiency. (a) GW4 and GW7, (b) GTAW4 and GTAW7. The irradiation was performed by a LED at 365 nm (irradiance 80 W/m<sup>2</sup>). The irradiation lasted until a transmittance value lower than 5% was achieved.

**Table S1** - Main vibration modes and related wavenumbers (cm<sup>-1</sup>) in the FTIR spectra of non-crosslinked films.  $\nu$ : stretching (s: symmetric, as: asymmetric),  $\delta$ : bending

<b><i>Vibration modes</i></b>	<b>G</b>	<b>GW7</b>	<b>GP7</b>
$\nu$ -NH ; $\nu$ -OH	3450 - 3295	3485 - 3305	3490 – 3305
$\nu_s$ and $\nu_{as}$ -CH <sub>2</sub>	2950 - 2880	2930 - 2875	2955-2880
$\nu$ C=O <i>amide I</i>	1627	1632	1632
$\delta$ N-H ; $\nu$ C-N <i>amide II</i>	1543	1550	1550
$\delta$ -CH <sub>2</sub>	1450	1440	1440
$\delta$ -NH <i>amide III</i>	1235	1289 - 1240	1283 - 1230
$\nu$ C-O	1080	1081	1081

**Table S2** - Main vibration modes and related wavenumbers (cm<sup>-1</sup>) in the FTIR spectra of crosslinked films.  $\nu$ : stretching (s: symmetric, as: asymmetric),  $\delta$ : bending

<b><i>Vibration modes</i></b>	<b>GTA</b>	<b>GTAW7</b>	<b>GTAP7</b>
$\nu$ -NH ; $\nu$ -OH	3510-3290	3570-3305	3485-3296
$\nu_s$ and $\nu_{as}$ -CH <sub>2</sub>	3935-	2952-2878	2935-2875
$\nu$ C=O <i>amide I</i>	1635	1633	1632
$\delta$ N-H ; $\nu$ C-N <i>amide II</i>	1538	1547	1544
$\delta$ -CH <sub>2</sub>	1452-1401	1444	1448-1400
$\delta$ -NH <i>amide III</i>	1237	1288-1237	1284-1237
$\nu$ C-O	1078	1079	1080