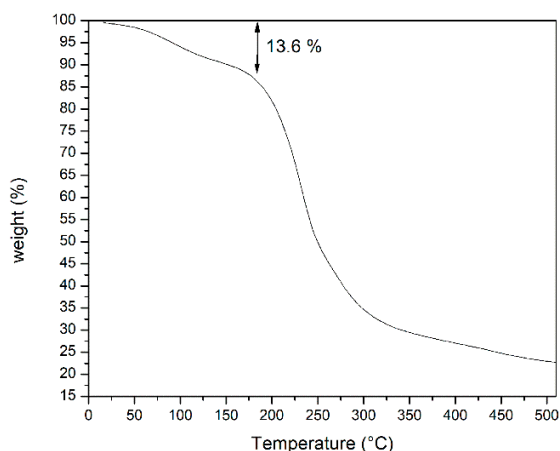
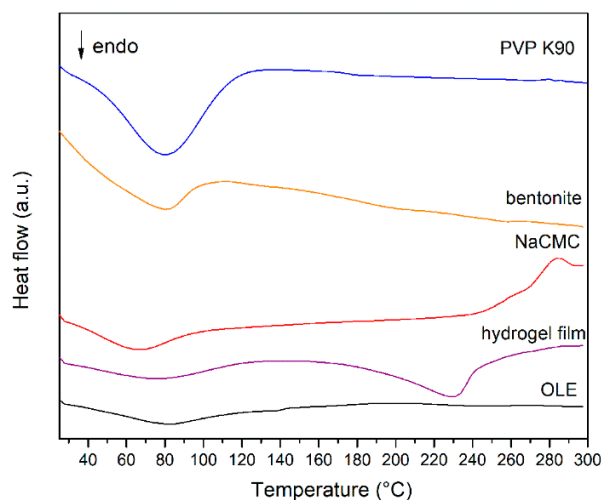


## Supplementary material

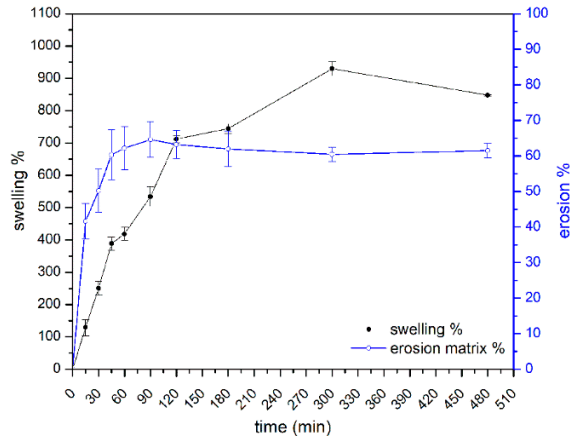


**Figure S1.** The TGA curve shows three steps: the first one until  $\sim 200^{\circ}\text{C}$  corresponding to the vaporization of residual water (13.6%), the second step until  $\sim 500^{\circ}\text{C}$  due to the decomposition of the organic components, the third one above  $500^{\circ}\text{C}$  characterized by a mineral residue ( $\sim 22.78\%$ ) due to bentonite content.



**Figure S2.** PVP K90 shows a broad endothermic peak between  $\sim 45\text{-}120^{\circ}\text{C}$  due to the evaporation of bound water or moisture. For bentonite it is detectable a broad band between  $\sim 60\text{-}100^{\circ}\text{C}$  attributable to adsorbed water loss. NaCMC shows a glass transition temperature (T<sub>g</sub>) at  $\sim 75^{\circ}\text{C}$ , corresponding and an exothermic peak at  $\sim 284^{\circ}\text{C}$  due to the melting and the crystallization transition. Pre OLE thermogram shows that thermal process occurs at  $\sim 80^{\circ}\text{C}$  probably related to the loss of volatile constituent of the sample (ethanol). No thermal decomposition was observed in the temperature range investigated. For the

hydrogel film B2 a glass transition temperature (T<sub>g</sub>) at 228°C was observed. The spectra are shown in arbitrary units (a.u.) and shifted for clarity.



**Figure S3.** Swelling % and erosion % of the hydrogel film B2 in SWF thermostated at 32°C for 480 min.

**Table S1.** Hydrogels compositions.

| Hydrogel | NaCMC<br>(w/w %) | PVP K90<br>(w/w %) | bentonite<br>(w/w %) | glicerol<br>(w/w %) | ultrapure water<br>(w/w %) |
|----------|------------------|--------------------|----------------------|---------------------|----------------------------|
| 1        | 2.0              | 0.1                | 1.0                  | 10.0                | 86.9                       |
| 2        | 2.0              | 0.1                | 2.0                  | 10.0                | 85.9                       |
| 3        | 2.0              | 0.1                | 3.0                  | 10.0                | 84.9                       |
| 4        | 2.0              | 0.1                | 4.0                  | 10.0                | 83.9                       |
| 5        | 3.0              | 0.1                | 4.0                  | 10.0                | 82.9                       |
| 6        | 3.0              | 0.1                | 1.0                  | 10.0                | 85.9                       |

**Table S2.** Compositions of hydrogels loaded with different OLE percentages.

| Hydrogel | OLE<br>(w/w %) | NaCMC<br>(w/w %) | PVP<br>K90<br>(w/w %) | bentonite<br>(w/w %) | glicerol<br>(w/w %) | ultrapure<br>water<br>(w/w %) | *mg OLE/cm <sup>2</sup> |
|----------|----------------|------------------|-----------------------|----------------------|---------------------|-------------------------------|-------------------------|
| B1       | 1.0            | 3.0              | 0.1                   | 1.0                  | 10.0                | 84.9                          | 3.64                    |
| B2       | 3.0            | 3.0              | 0.1                   | 1.0                  | 10.0                | 82.9                          | 10.92                   |
| B3       | 5.0            | 3.0              | 0.1                   | 1.0                  | 10.0                | 80.9                          | 18.21                   |

\*amount of OLE/cm<sup>2</sup> in the hydrogel films after drying in oven.

**Table S3.** Bacterial strains and growth conditions.

| <b>Gram positive bacteria</b>                | <b>Growth conditions</b>                     |
|--|--|
| <i>Staphylococcus epidermidis</i> WDCM 00036 | 37°C for 24 ± 2 h                            |
| <i>Enterococcus faecalis</i> WDCM 00087      | 37°C for 24 ± 2 h                            |
| <i>Lactobacillus sakei</i> WDCM 00015        | 30°C for 48-72 h                             |
| <i>Bacillus cereus</i> WDCM 00001            | 30°C for 24 ± 2 h                            |
| <i>Listeria innocua</i> WDCM 00017           | 37°C for 24-48 h                             |
| <i>Clostridium perfringens</i> WDCM 00007    | 37° C for 24-48 h<br>anaerobic<br>atmosphere |
| <i>Staphylococcus aureus</i> WDCM 00034      | 37°C for 24 ± 2 h                            |
| <b>Gram negative bacteria</b>                |  |
| <i>Pseudomonas aeruginosa</i> WDCM 00025     | 25°C for 24-48 h                             |
| <i>Klebsiella pneumoniae</i> WDCM 00097      | 37°C for 24 ± 2 h                            |
| <i>Enterobacter aerogenes</i> WDCM 00175     | 37°C for 24-48 h                             |
| <i>Escherichia coli</i> WDCM 00013           | 37°C for 24 ± 2 h                            |