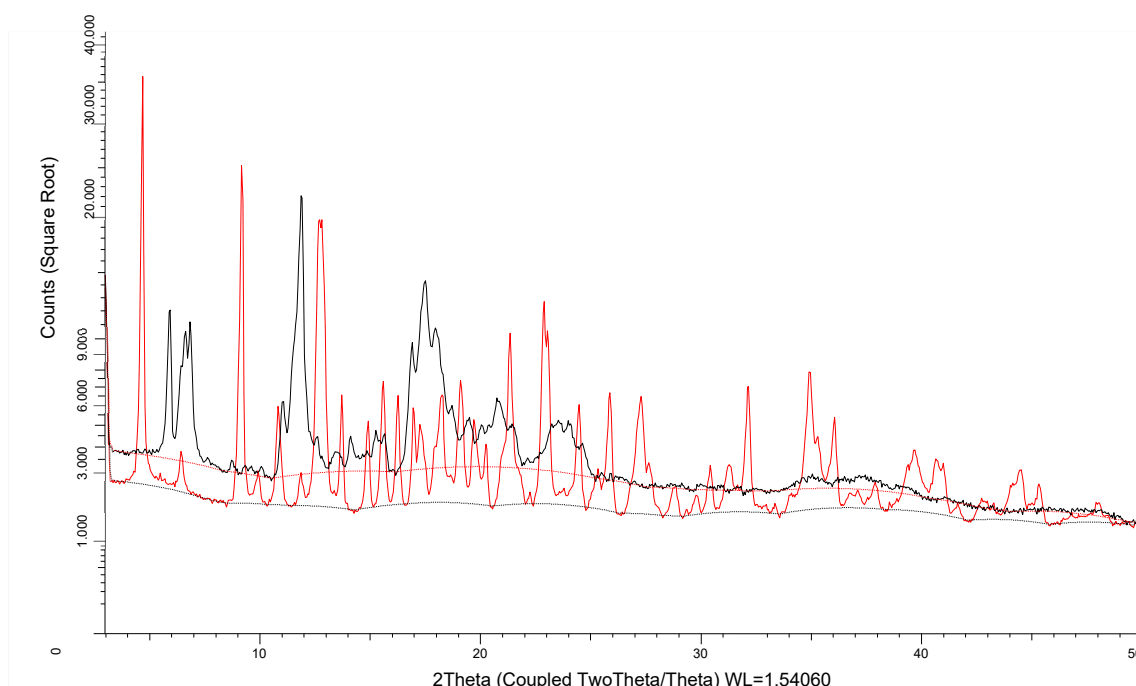


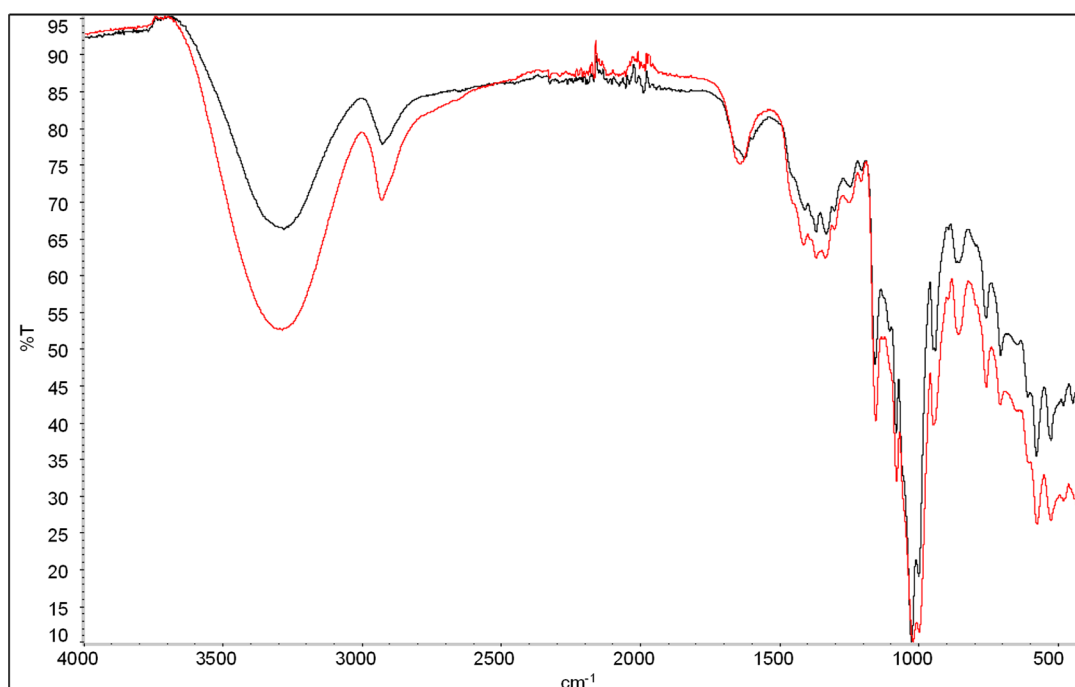
**Supplementary File S3.** Characterization of the EO-CD inclusion complex (XRD, FTIR, SEM, and TEM)

**X-Ray diffraction (XRD)** analyses of  $\beta$ CD and the EO- $\beta$ CD inclusion complex are shown in Figure S3.1. The XRD analysis shows that the intense and sharp peaks of the  $\beta$ -CD is crystalline in nature. After EO encapsulation, the intensity and profile of  $\beta$ -CD were modified (e.g. peaks at 4.8 °C and 8 °C), which indicates the formation of bonds between the  $\beta$ -CD molecule and EO [1].



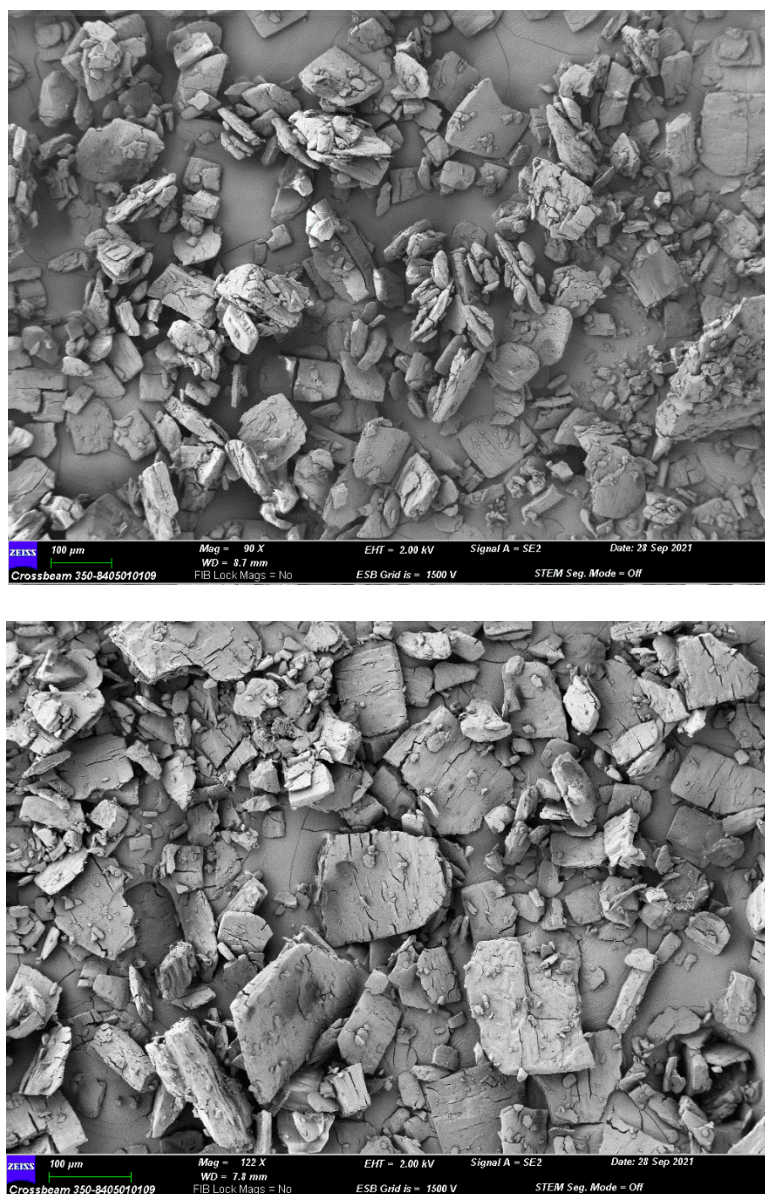
**Figure S3.1.** X-Ray diffraction (XRD) analyses of  $\beta$ -CD (red colour line) and the EO- $\beta$ CD inclusion complex (black colour line). An XRD diffractometer (Bruker D8 Advance; Bruker, Billerica MA, USA) was used. X-ray diffractograms were obtained using Cu-K $\alpha$  ( $\lambda = 1.5418 \text{ \AA}$ ) radiation in a  $2\theta$  range from  $3^\circ$  to  $60^\circ$  with  $0.02^\circ$  steps at  $1^\circ/\text{min}$ .

**Fourier Transform Infrared spectroscopy (FTIR)** analyses of  $\beta$ CD and the EO- $\beta$ CD inclusion complex are shown in Figure S3.2. The characteristic peaks of  $\beta$ CD were identified at 3,300 (–OH stretch), 2,925 (vibration of C–H stretch), 1,643 (bending of H–O–H), 1,157 (vibrations of the asymmetric stretch of the C–O–C) and 1,023  $\text{cm}^{-1}$  (symmetric stretching link C–O–C). Nevertheless, the FTIR spectra of the EOs- $\beta$ CD inclusion complex showed that the intensity of peaks was minimised, which indicates the modification of bonds after the inclusion complex formation, as previously found [1,2].



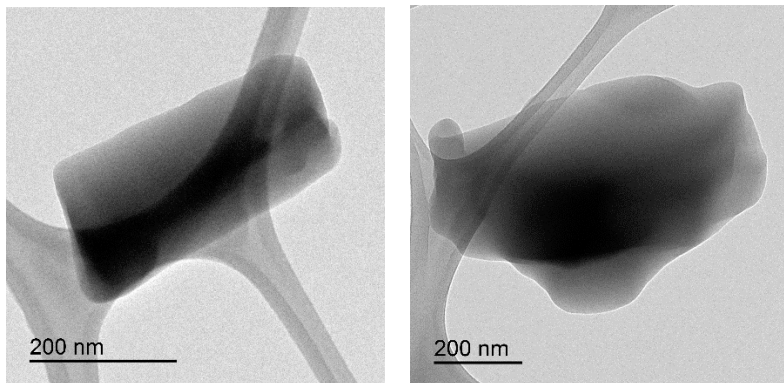
**Figure S3.2.** Fourier Transform Infrared spectroscopy (FTIR) analyses of  $\beta$ -CD (red colour line) and the EO- $\beta$ CD inclusion complex (black colour line). An FTIR spectrometer (Thermo Scientific Nicolet 5700, Berlin, Germany) was used in absorbance mode and wavenumbers between 400 and 4,000  $\text{cm}^{-1}$ . For sample preparation, 2 mg of samples were mixed with 200 mg of KBr and this mixture was then pressed to form tablets with a thickness of 1 mm.

**Scanning electron microscope (SEM)** images (Figure S3.3) show that the particle size of the EO- $\beta$ CD inclusion complex is smaller than the particle size of pure  $\beta$ CD, which may indicate the formation of the inclusion complex.



**Figure S3.3.** The microscopic morphology of  $\beta$ -CD (up image) and the EO- $\beta$ CD inclusion complex (down image) was studied using a scanning electron microscope (SEM) (S-3500N; Hitachi, Tokyo, Japan). Samples were previously coated with gold in a sputter coater (SC7640; Quorum Technologies, East Sussex, England) and then observed with the SEM at 2 kV.

**Transmission electron microscopy (TEM)** images (Figure S3.4) show the particle size of the EO- $\beta$ CD inclusion complex.



**Figure S3.4.** Transmission electron microscopy (TEM) of the EO- $\beta$ CD inclusion complex was studied using a TEM (JEM-1400 Plus; Jeol Ltd., Tokyo, Japan), which worked at 120 keV. Samples were previously dispersed in deionized water using an ultrasonic homogenizer for 5 min. Certain quantity of the suspension was diluted and dropped onto a carbon-coated grid and kept for 1 min. After the removal of excess suspension by filter paper, the grid was dried overnight.

1. Marques, C.S.; Carvalho, S.G.; Bertoli, L.D.; Villanova, J.C.O.; Pinheiro, P.F.; dos Santos, D.C.M.; Yoshida, M.I.; de Freitas, J.C.C.; Cipriano, D.F.; Bernardes, P.C.  $\beta$ -Cyclodextrin inclusion complexes with essential oils: Obtention, characterization, antimicrobial activity and potential application for food preservative sachets. *Food Res. Int.* **2019**, *119*, 499–509, doi:10.1016/j.foodres.2019.01.016.
2. Buendía–Moreno, L.; Soto–Jover, S.; Ros–Chumillas, M.; Antolinos–López, V.; Navarro–Segura, L.; Sánchez–Martínez, M.J.; Martínez–Hernández, G.B.; López–Gómez, A. An innovative active cardboard box for bulk packaging of fresh bell pepper. *Postharvest Biol. Technol.* **2020**, *164*, 111171, doi:10.1016/j.postharvbio.2020.111171.