

Table 1. Specifications for thermoplastics, calcium carbonate and triclosan

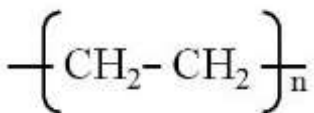
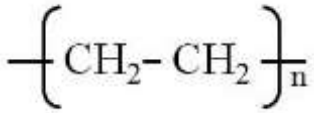
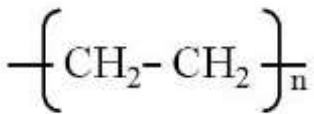
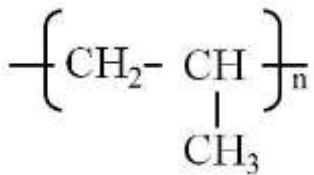
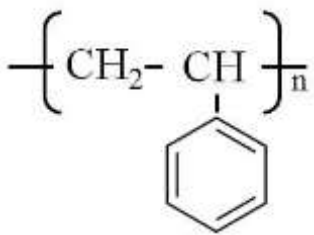
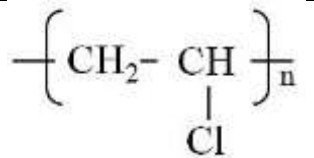
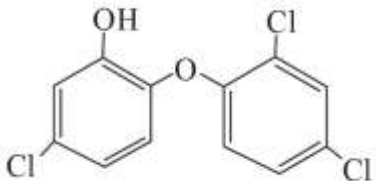
Materials	Grade	Supplier	Specification	Chemical Structure
Low density polyethylene (LDPE)	1902F	SCG public co. ltd. (Thailand)	Density 0.919 g·cm ³ T _m = 110 °C T _g = -110 °C	
Medium density polyethylene (MDPE)	M380RU/RUP	Thai polyethylene co., ltd. (Thailand)	Density 0.940 g·cm ³ T _m = 126 °C T _g = -100 °C	
High density polyethylene (HDPE)	HD6000F	PTT polymer marketing co. ltd. (Thailand)	Density 0.956 g·cm ³ T _m = 131 °C T _g = -90 °C	
Polypropylene (PP)	401S	SCG public co. ltd. (Thailand)	Density 0.910 g·cm ³ T _m = 163 °C T _g = -20 °C	
Polystyrene (PS)	Styron 656D267	Siam polystyrene co. ltd. (Thailand)	Density 1.05 g·cm ³ T _g = 95 °C	
Polyvinylchloride (PVC)	SIAMVIC 258RB	V.P. wood co. ltd. (Thailand)	Density 1.380 g·cm ³ T _g = 82 °C	
Calcium carbonate (CaCO ₃)	Hicoat 410	Sand and Soil Industry co. ltd. (Thailand)	Average diameter of 1 micrometer	-
Triclosan (2,4,4'-trichloro-2'-hydroxydiphenyl ether)	24 USP grade	Goventure co. ltd. (Thailand)	White powder from Average size of micrometer T _m = 56-58 °C T _d > 280°C	

Table 2. Changes in color and light transmission for triclosan incorporated thermoplastics

Colour Index	Polymer with Triclosan (x10 ⁴ ppm)											
	LDPE		MDPE		HDPE		PP		PS		PVC	
	0	1.5	0	1.5	0	1.5	0	1.5	0	1.5	0	1.5
<i>L*</i>	37.54	41.3	39.26	39.02	47.77	41.31	34.39	33.84	37.6	37.26	29.68	32.77
<i>a*</i>	0.06	-0.12	0.14	-0.19	-0.3	-0.76	-0.07	-0.23	-0.09	-0.2	2.68	2.63
<i>b*</i>	-2.85	-3.79	-2.99	-2.01	-7.01	-1.5	-1.63	-0.31	-1.13	-0.46	2.81	2.88
<i>ΔE*</i>	-	3.88	-	1.06	-	8.50	-	1.44	-	0.76	-	3.09
<i>%T</i>	88	83.2	86.3	85	78.3	82	89.4	90.1	89.3	88.1	70.9	72.5
<i>Tvis</i>	87.3	81.5	85.6	84.3	74.8	78.4	89.1	89.7	89.6	88.2	57	67.8

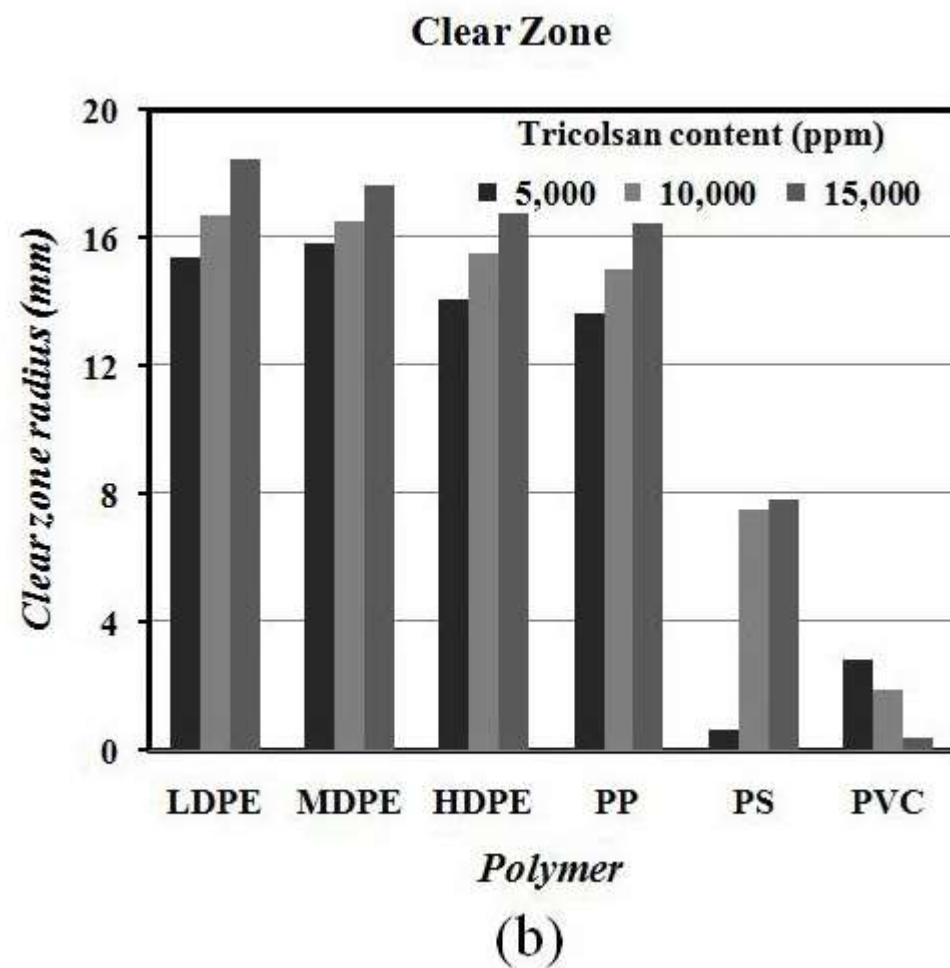
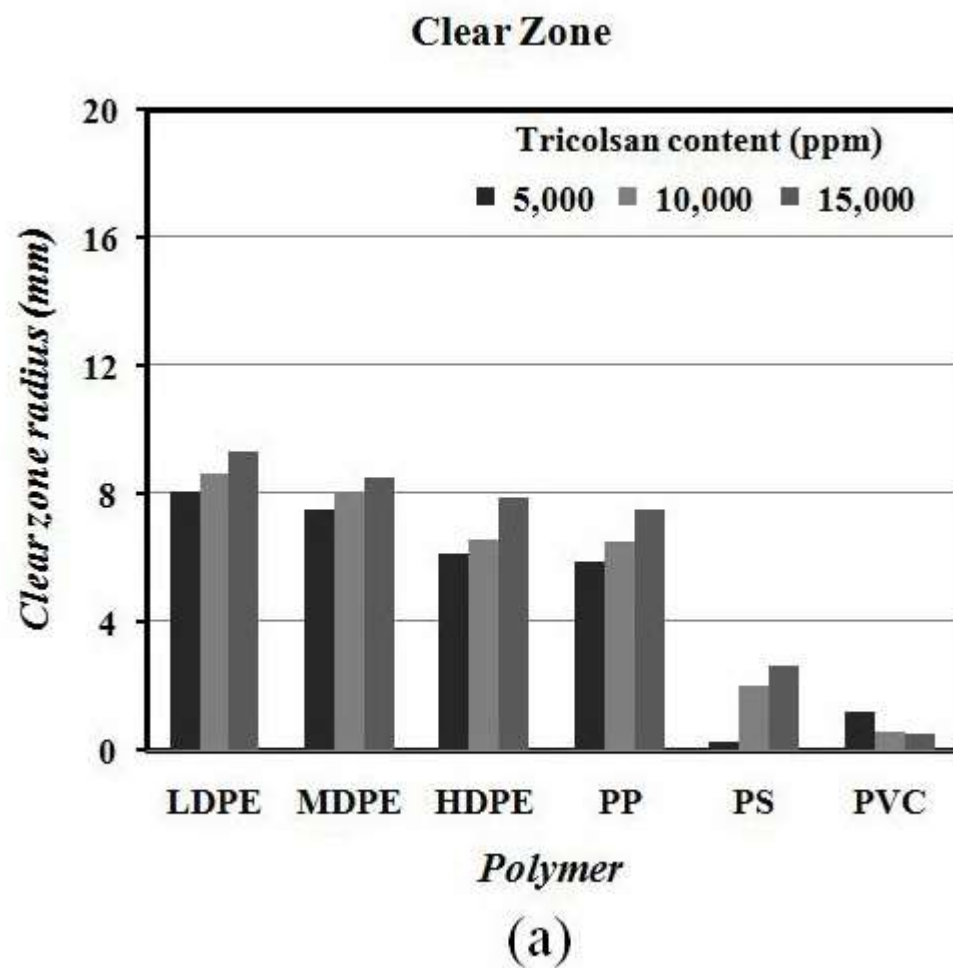


Figure 1. Inhibition zone results from Halo test for different thermoplastic film specimens for different loadings of triclosan

(a) *E.coli* and (b) *S.aureus*

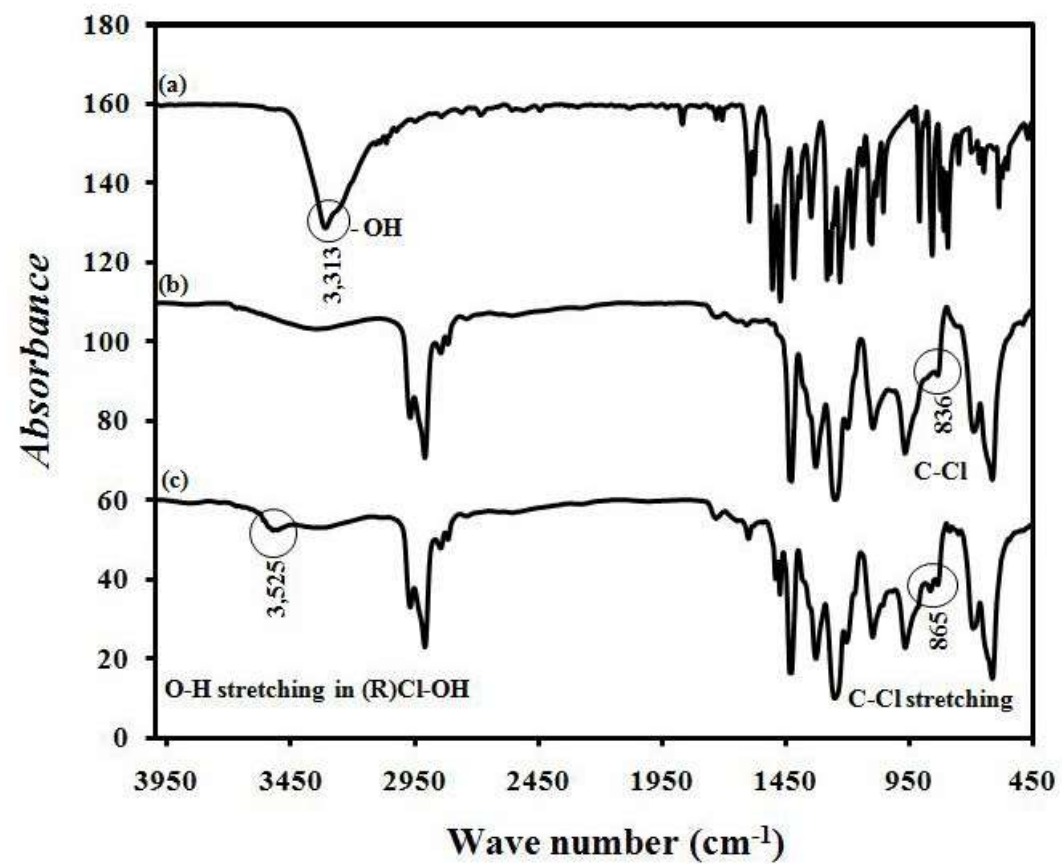
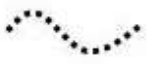
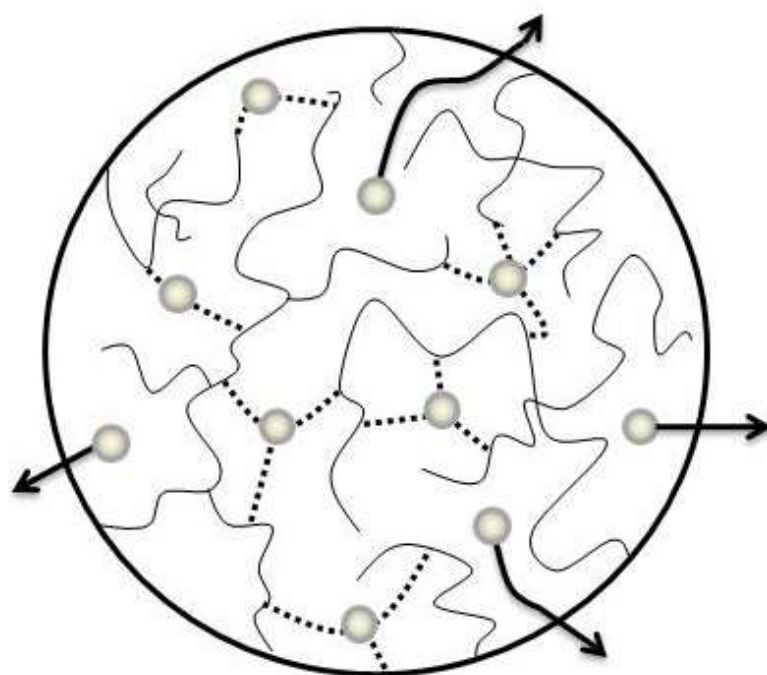


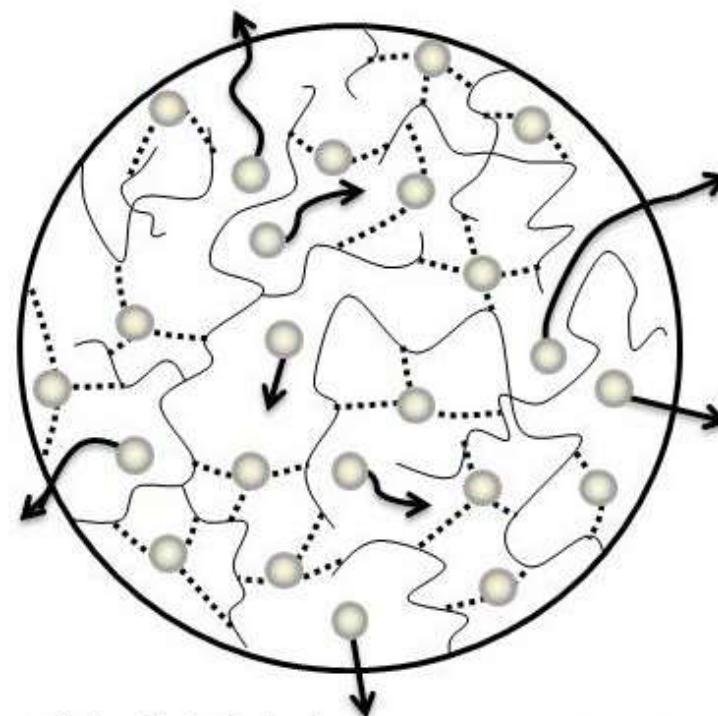
Figure 2. FT-IR spectra (a) Triclosan (b) PVC and (c) PVC containing 15,000 ppm triclosan

 = **polymer chain (PVC)**
  = **polar-polar interaction**
  = **triclosan molecule**
  = **triclosan diffusion**



Low Triclosan content

(a)



High Triclosan content

(b)

Figure 3. A proposed schematic model for diffusions mechanism of triclosan molecules in PVC
 (a) low triclosan concentration (b) high triclosan concentration

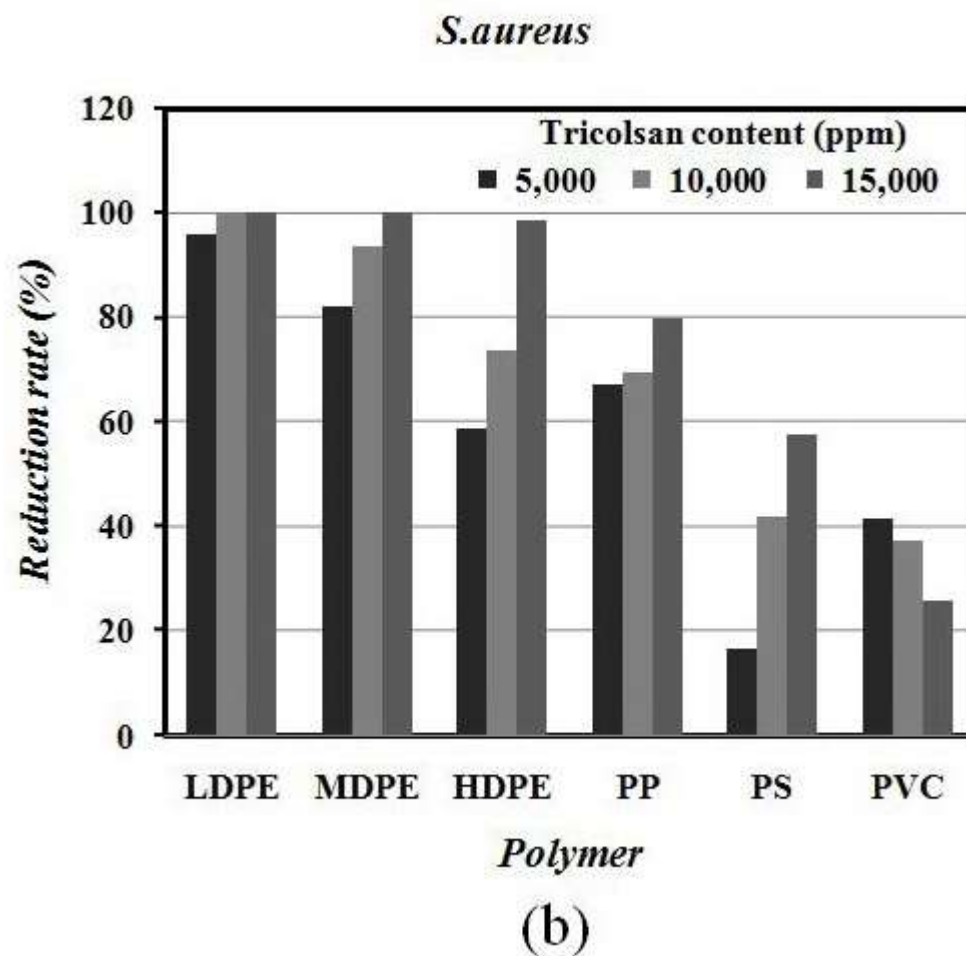
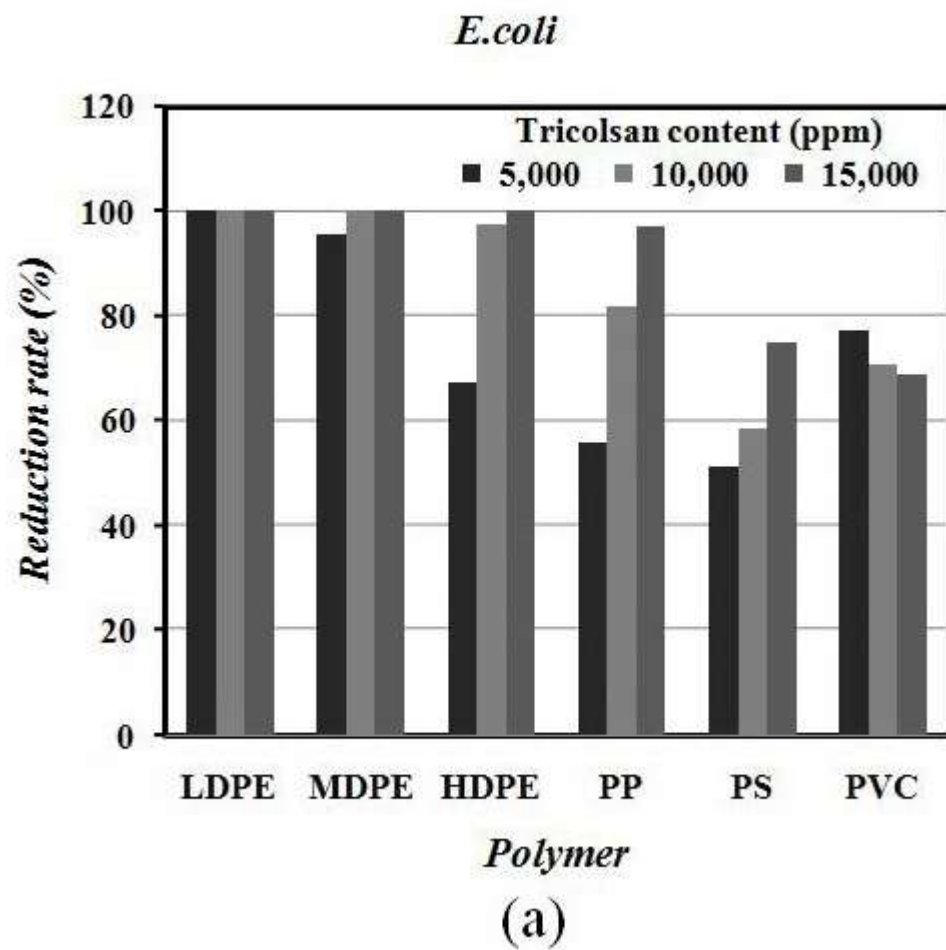


Figure 4. Percentage reduction rates for different thermoplastics at various triclosan contents by PCA method

(a) *E.coli* and (b) *S.aureus*

Table 3. Triclosan releasing rate results for thermoplastic films with different triclosan loadings

Triclosan content	Triclosan releasing rate (g x 10 ⁻⁵) in polymers					
(ppm) in polymers	LDPE	MDPE	HDPE	PP	PS	PVC
5,000	32.6	20.4	10.2	8.7	8.0	9.5
10,000	85.2	24.2	13.7	9.4	8.0	8.4
15,000	100.2	29.5	14.2	9.8	8.3	8.1

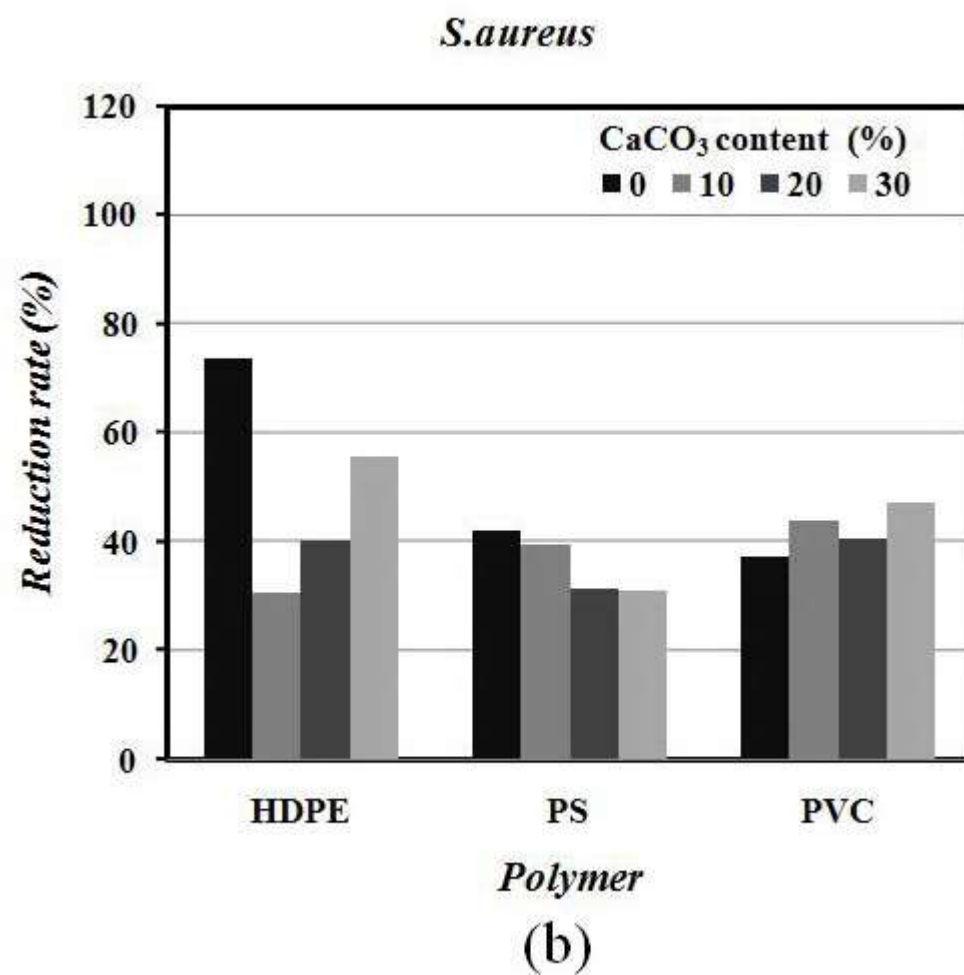
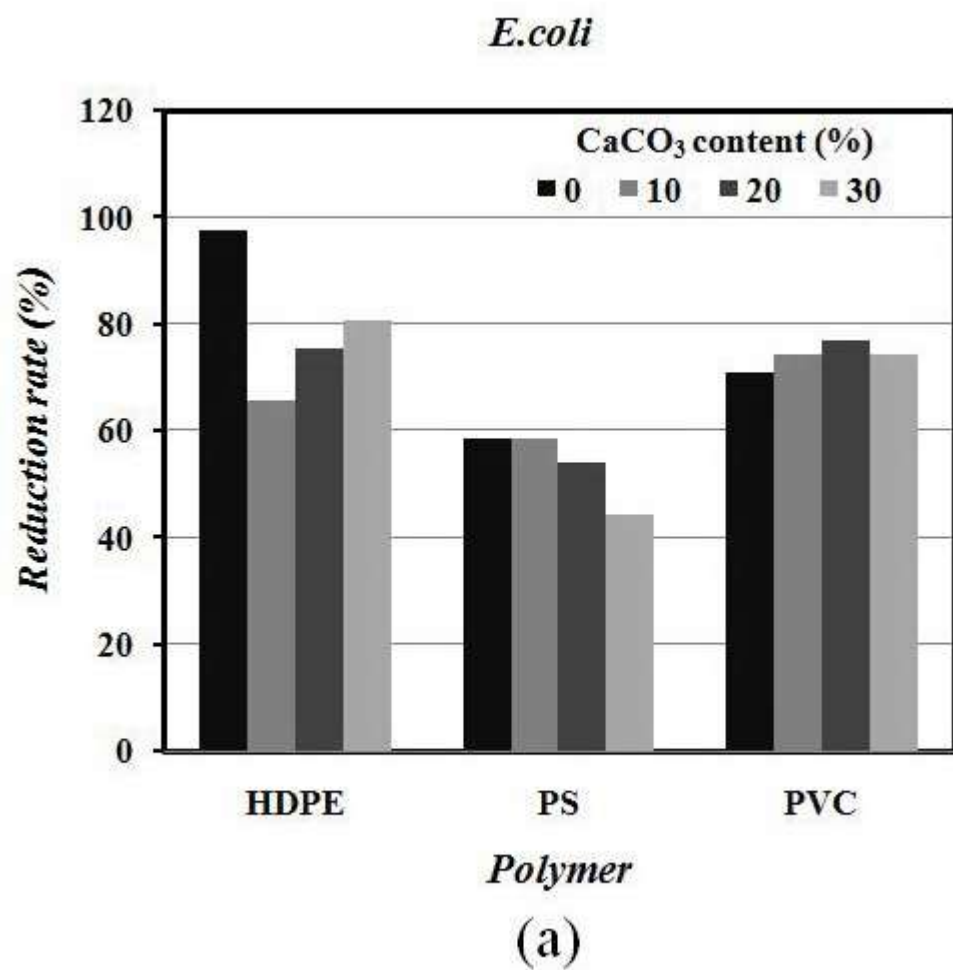


Figure 5. Effect of CaCO₃ content on percentage reduction rate for HDPE, PS and PVC film specimens with 10,000 ppm triclosan content

(a) *E.coli* and (b) *S.aureus*