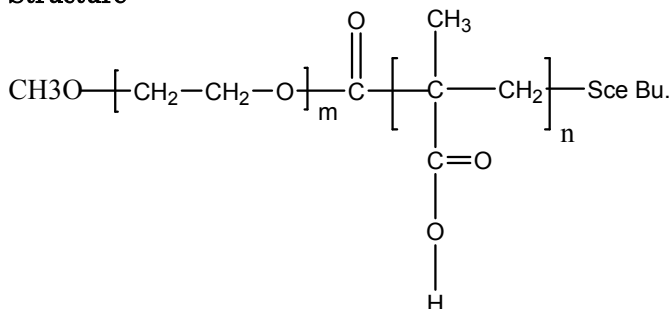


Sample Name: Poly(ethylene oxide -b- methacrylic acid)

Sample #: P8038-EOMAA

Structure:



Composition:

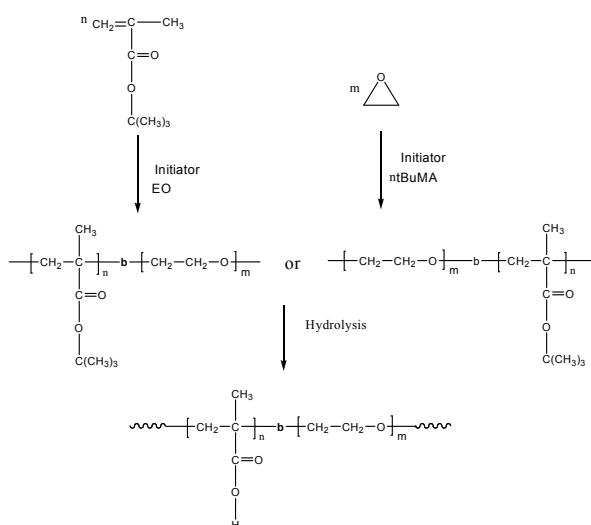
Mn × 10 ³ PEO-b-PMAA	PDI
5.0-b-7.0	1.15

Synthesis Procedure:

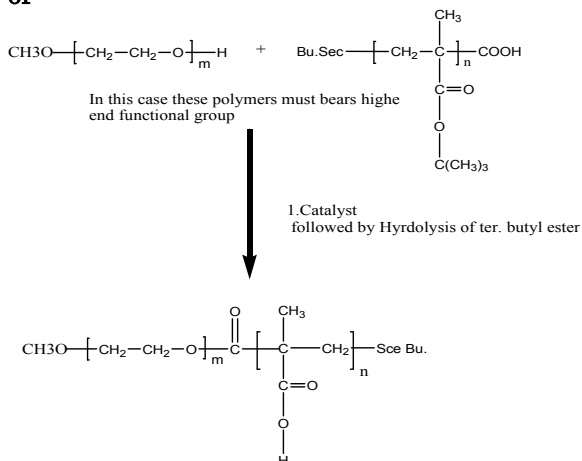
Poly(ethylene oxide -b- methylacrylic acid) is prepared by 2 different routes:

A. By living anionic polymerization of sequential addition of EO and tBuMA (ethylene oxide or t-butyl methacrylate) followed by hydrolysis of the t-butyl group¹ or

B. By chemical coupling reaction of the corresponding functionalized polymer. The scheme of the reaction is illustrated below:



or



Characterization:

An aliquot of the first anionic block was terminated before addition of the second block and analyzed by size exclusion chromatography (SEC) to obtain the molecular weight and polydispersity index (PDI). The final block copolymer composition was calculated from ¹H-NMR spectroscopy by comparing the peak area of the ethylene oxide protons at about 3.6 ppm with the tert.butyl protons at about 1.4 ppm.

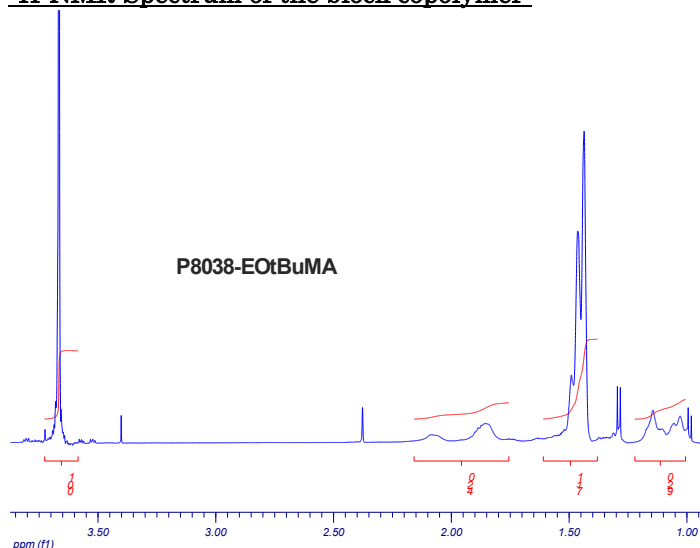
Hydrolysis:

To cleave the tert.butyl ester moiety the hydrolysis was carried out in dioxane using acid catalyst. The degree of hydrolysis was checked by FTIR the disappearance of characteristics at 1362 cm⁻¹.

Solubility:

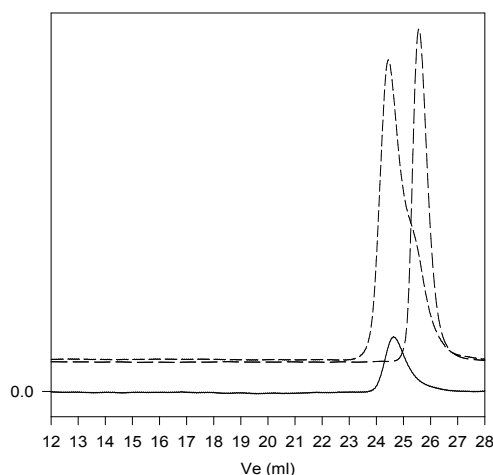
Poly(ethylene oxide -b- methacrylic acid) is soluble in water, THF, methanol, ethanol and precipitate out in hexane, ether.

¹H-NMR Spectrum of the block copolymer:



SEC of the block copolymer:

P8038-tBMAEO



Size exclusion chromatography of poly(t-butyl methacrylate-b-ethylene oxide)

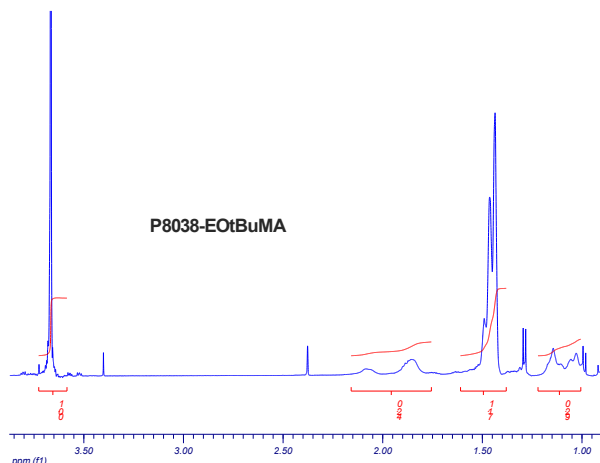
— cooh TERMINATED Poly(tert.butylmethacrylate), M_n=11500 M_w=12600, PI=1.10

--- Poly ethylene glycol methylether: Mn 5000 Mw: 5300 PI=1.06

--- After the linking reaction:
Poly (Ethylene oxide-b-tert. Butyl methacrylate):
Mn 5000-b-11500 PI=1.15

After hydrolysis of the ester function:

PEO-b-MAA Mn: 5000--b-7000 Mw/Mn 1.15



References:

J. Wang, **S. K. Varshney**, J. Jerome and Ph. Teyssie
 "Synthesis of AB (BA) ABA and BAB Block copolymers of
 tert-butylmethacrylate (A) and ethylene oxide
 (B) " *CA Vol 117, 16, 151478, J. Polym. Sci., Part-A: Polym.
 Chem. Ed., 1992, 30, 2251-2261.*

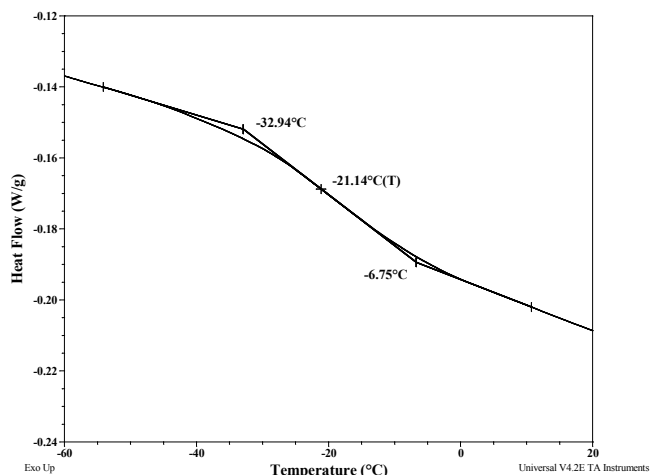
Thermal analysis of the P8038-EOMAA

Thermal analysis of the samples was carried out on a
 TA Q100 differential scanning calorimeter at a
 heating rate of 10°C/min. The midpoint of the slope
 change of the heat flow plot of the second heating
 scan was considered as the glass transition
 temperature (T_g).

Melting and crystallization curve for the sample

The melting temperature (T_m) was taken as the
 maximum of the endothermic peak where as the
 crystallization temperature (T_c) was considered as
 the minimum of the exothermic peak.

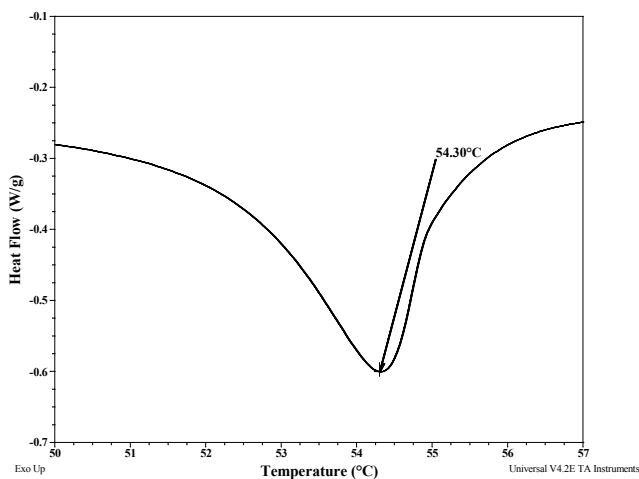
Thermogram for the EO block:



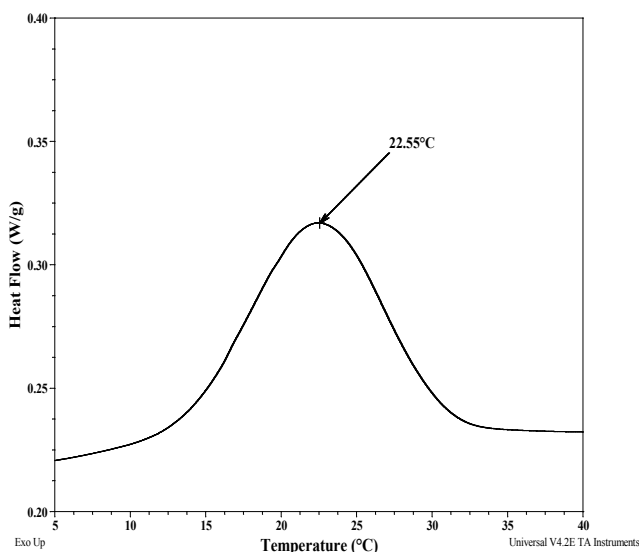
Thermal analysis results at a glance

Sample	T_m (°C)	T_c (°C)	T_g (°C)
EO Block	54	23	-21
AA block	-	-	200

Melting curve for the polymer:



Crystallization curve for EO block:



Thermogram for MAA block:

