

Identification of polymer types and additives in marine microplastic particles using pyrolysis-GC/MS and scanning electron microscopy

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Figure SI-1. Pyrogram of LDPE with the typical fingerprint of repetitive triple-peaks with the same distance representing alkadienes, alkenes and alkanes with increasing carbon number (C9-C30).

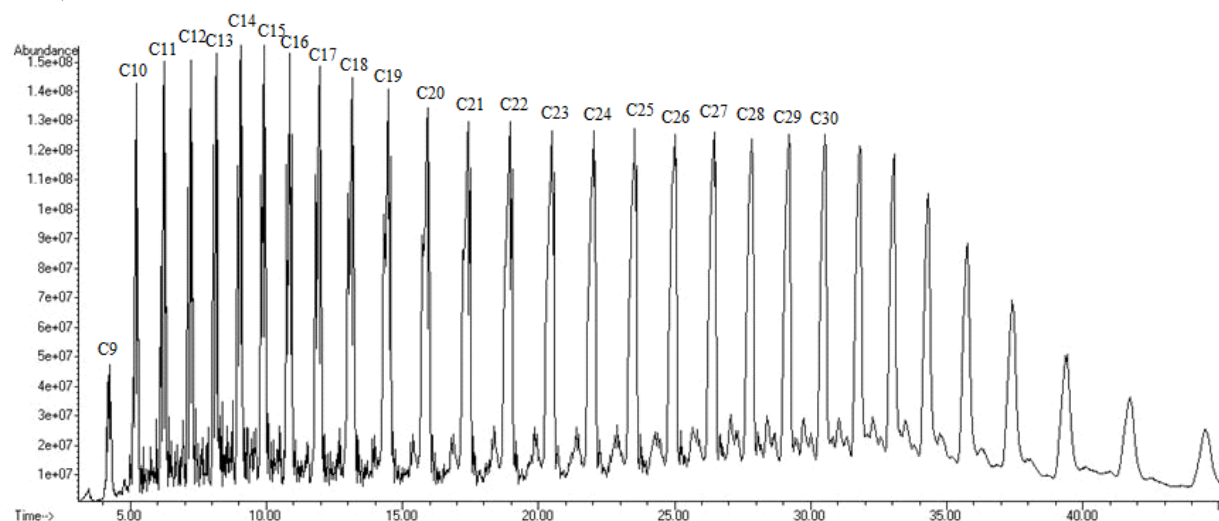


Figure SI-2. Triplet peaks in the pyrogram of LDPE. For example the first triplepeak between 8.00 and 8.50 min assigns to (1) tridecadiene, (2) tridecene and (3) tridecane.

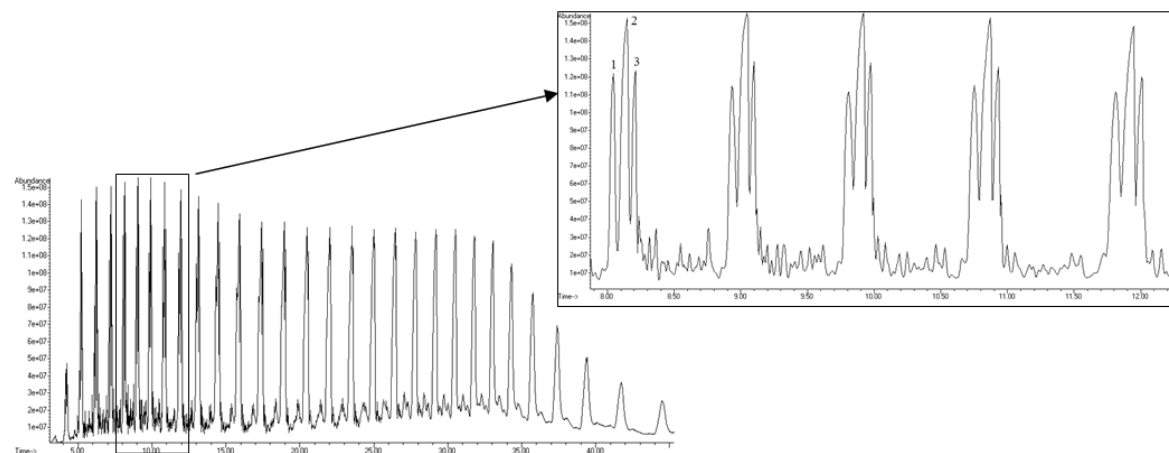


Figure SI-3. Section of the pyrogram of LLDPE with the same triple-peaks like LDPE. But in the pyrogram of LLDPE are less peaks between the triplets in comparison to LDPE.

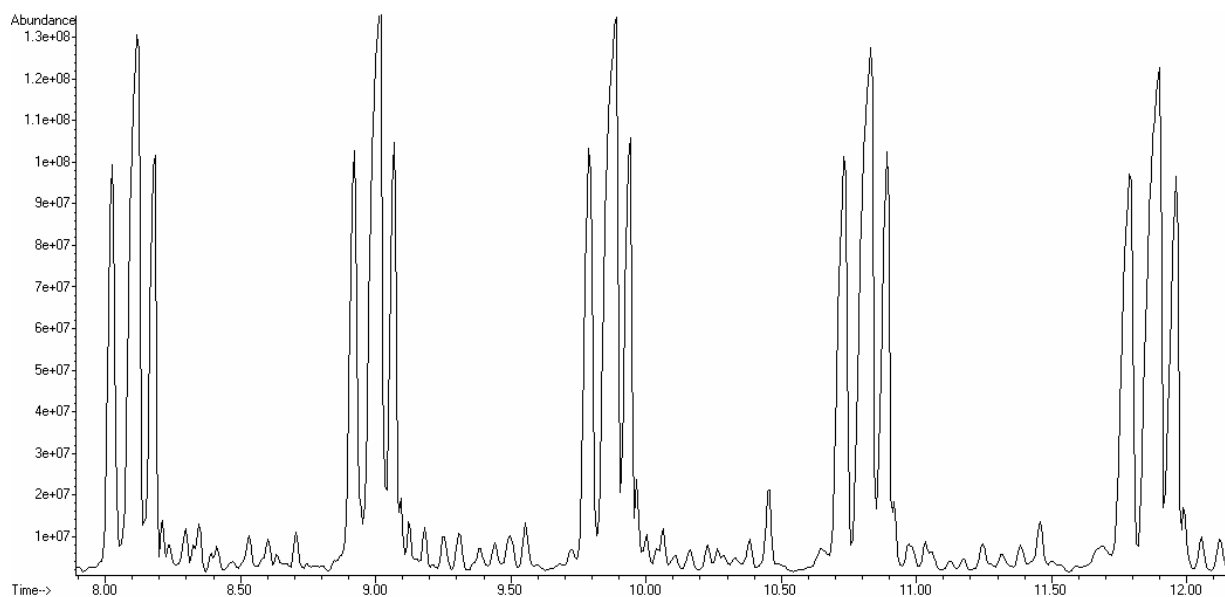


Figure SI-4. Section of the pyrogram of HDPE with the same triple-peaks like LDPE. Here the baseline shows almost not a single peak between the triplets compared to LDPE and LLDPE.

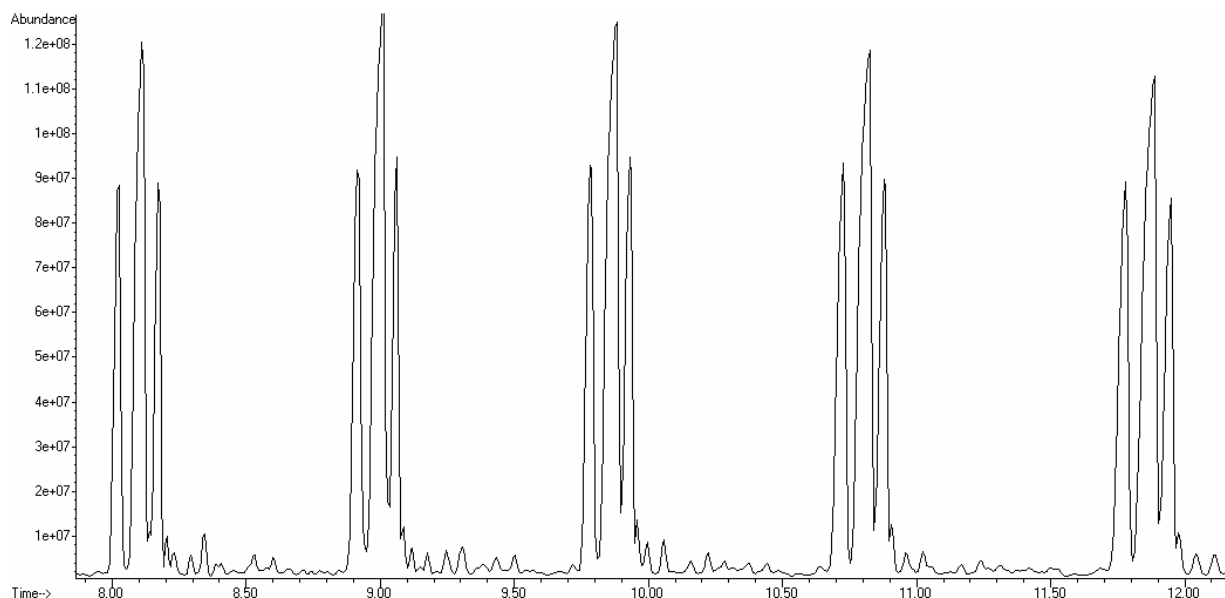


Figure SI-5. Pyrogram of PVC with a section of characteristic peaks identified as the main marker substances (1) toluene, (2) styrene, (3) indene, (4) naphthalene, (5) fluorene and (6) anthracene.

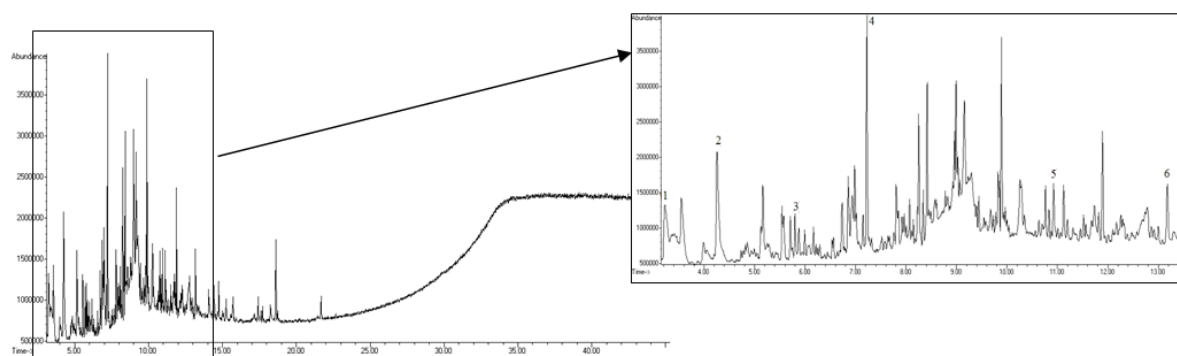


Figure SI-6. Pyrogram of PP showing again a typical fingerprint with repetitive peak-groups of eight to ten peaks. Main marker substances were here identified as (1) 2,4-dimethyl-1-heptene, (2) 2,6-dimethylnonane and 4,6-dimethyldodecane (retention time 7.66 min).

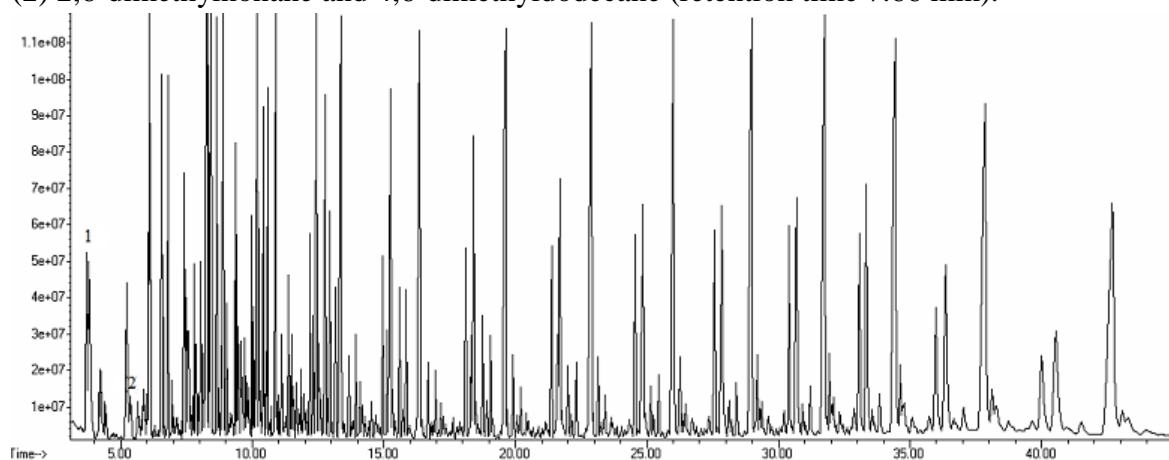


Figure SI-7. Pyrogram of PA 6. Characteristic peaks were identified as (1) hexanenitrile, (2) 6-amino-hexanenitrile and (3) caprolactam.

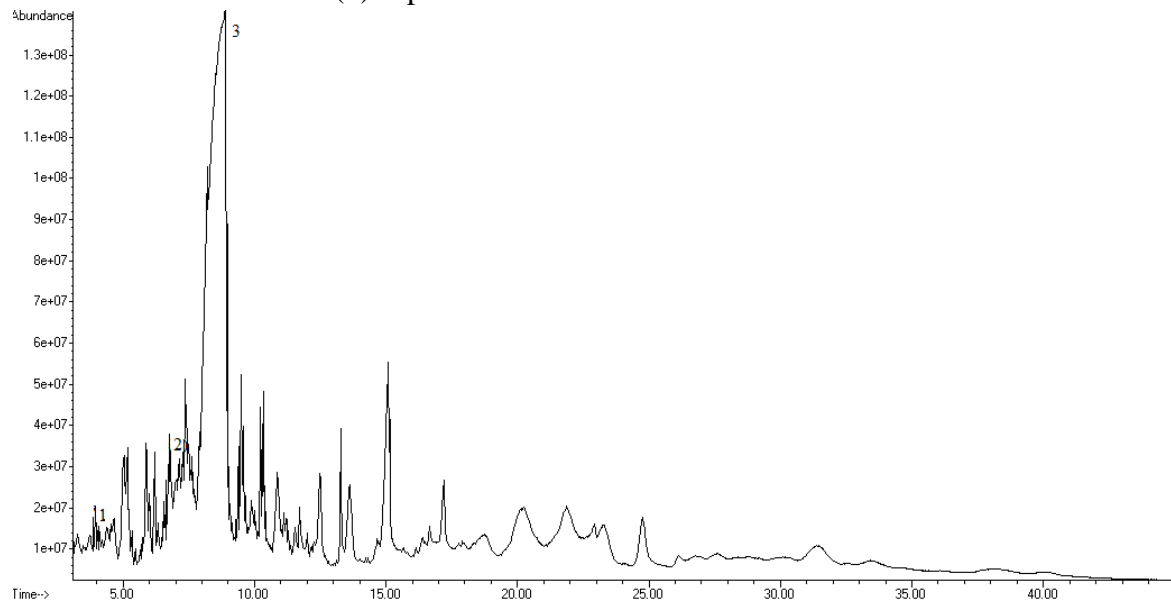


Figure SI-8. Pyrogram of PA 6 cast. Main peaks were identified as follows: (1) toluene, (2) styrene, (3) 1-dodecene, (4) naphthalene and (5) caprolactam, which was also identified for PA 6.

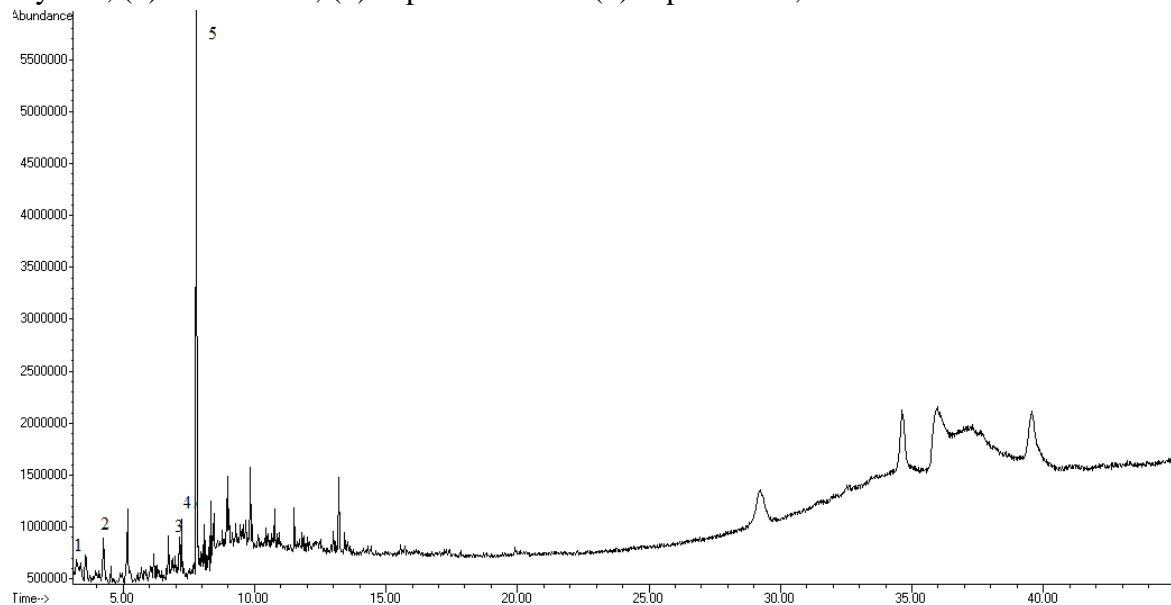


Figure SI-9. Pyrogram of PC. Typical pyrolysis products were (1) phenol, (2) 2-methylphenol, (3) 4-methylphenol, (4) p-isopropylphenol, (5) 4-(2-propenyl)phenol, (6) 4-(1-methyl-1-phenylethyl)-phenol and (7) bisphenol A.

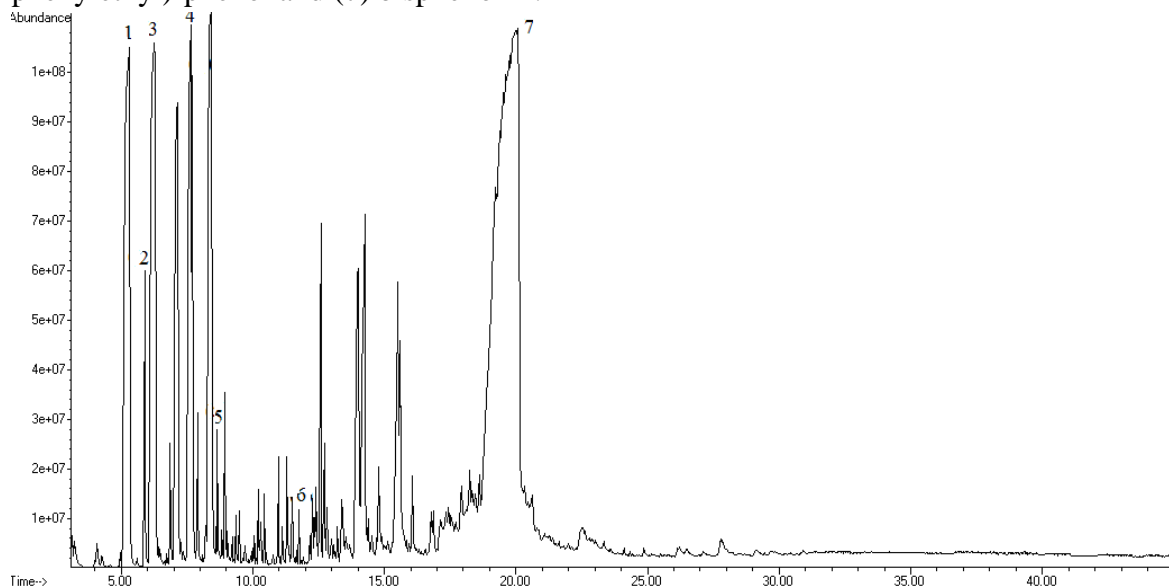


Figure SI-10. Pyrogram of PUR. Major peaks were identified as follows: (1) cyclopentanone, (2) pentanoic acid, (3) 1,4-butanediol, (4) diphenylmethane, (5) 4-(phenylmethyl)-benzenamine and (6) 4,4'-methylenebis-benzenamine.

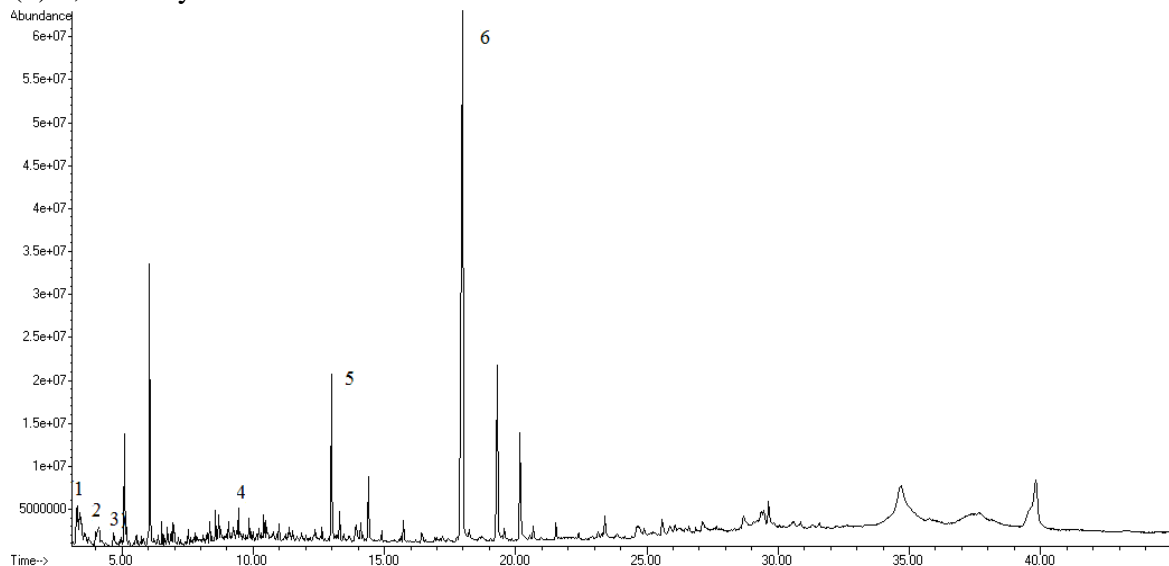


Figure SI-11. Pyrogram of PET with the identified pyrolysis products (1) benzaldehyde, (2) benzenepropanal, (3) benzoic acid, (4) 4-methylbenzoic acid, (5) biphenyl, (6) 4-ethylbenzoic acid and (7) 4-vinylbenzoic acid.

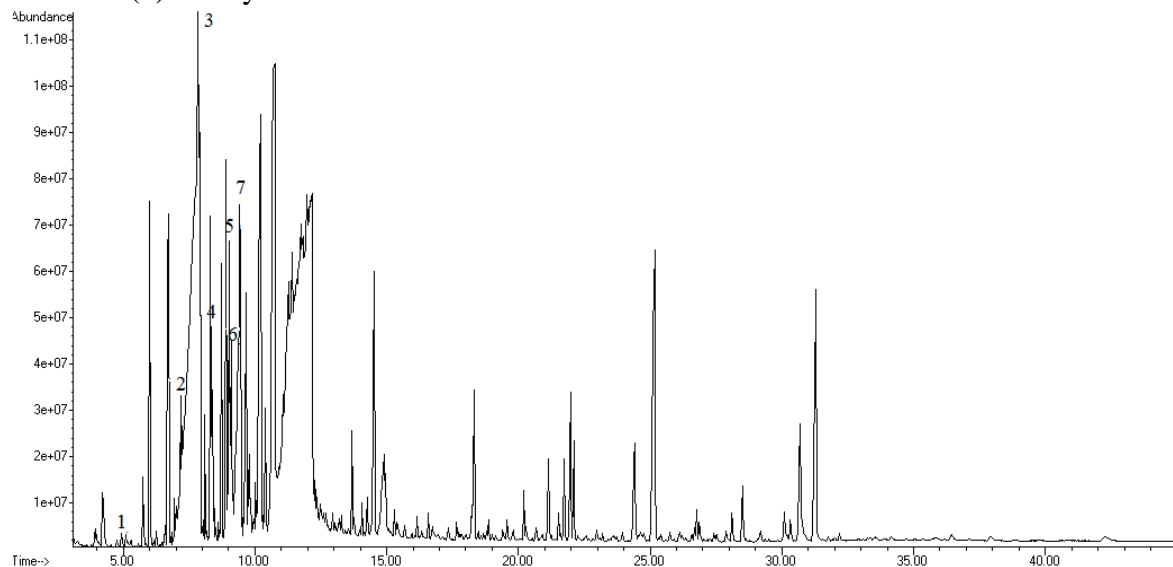


Figure SI-12. Pyrogram of PS showing three large peaks around 4.00, 12.50 and 23.00 min. As characteristic peaks (1) toluene, (2) styrene, (3) allylbenzene, (4) alpha-methylstyrene, (5) diphenylmethane, (6) bibenzyl, (7) 1,1'-(1,3- propanediyl)bis-benzene and (8) 2,5-diphenyl-1,5-hexadiene were identified.

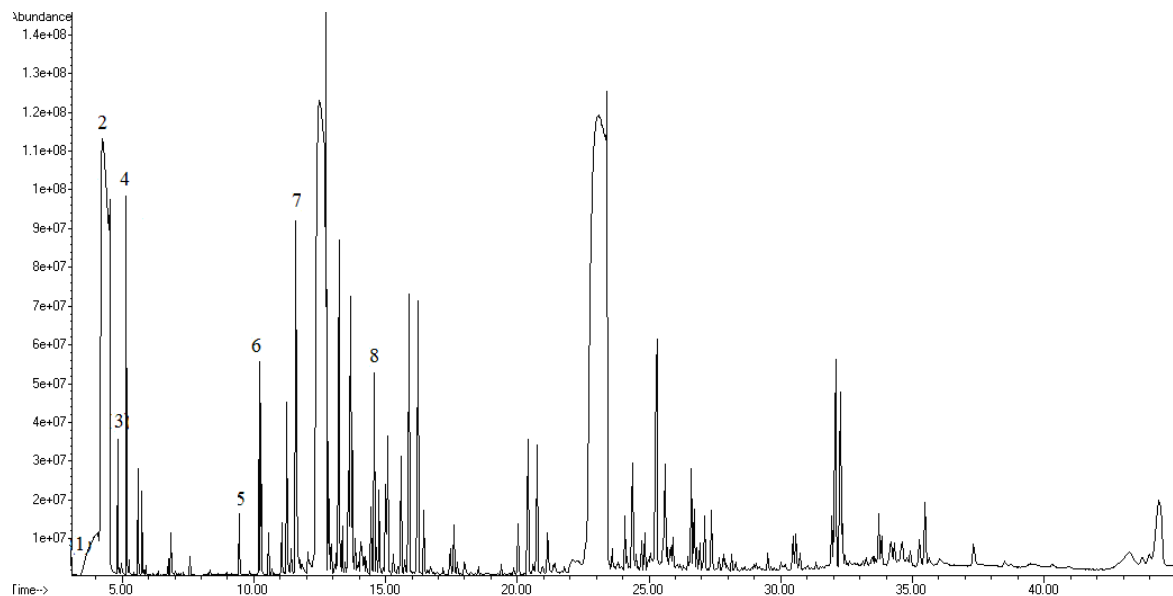


Figure SI-13. Pyrogram of ABS. Marker peaks were identified as follows: (1) styrene, (2) cumene, (3) propylbenzene, (4) alpha-methylstyrene and (5) 1,3-diphenylpropane.

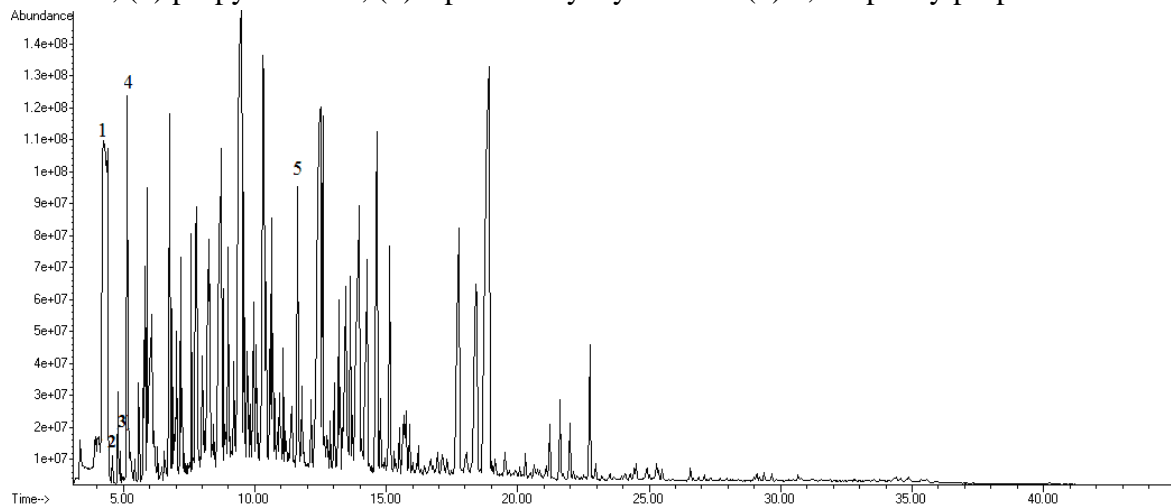


Figure SI-14. Pyrogram of EVA, which looks very similar to the pyrogram of LDPE and it also consists of the triple-peaks with alkadienes, alkanes and alkenes.

