Separations of PAHs 15+1

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Background

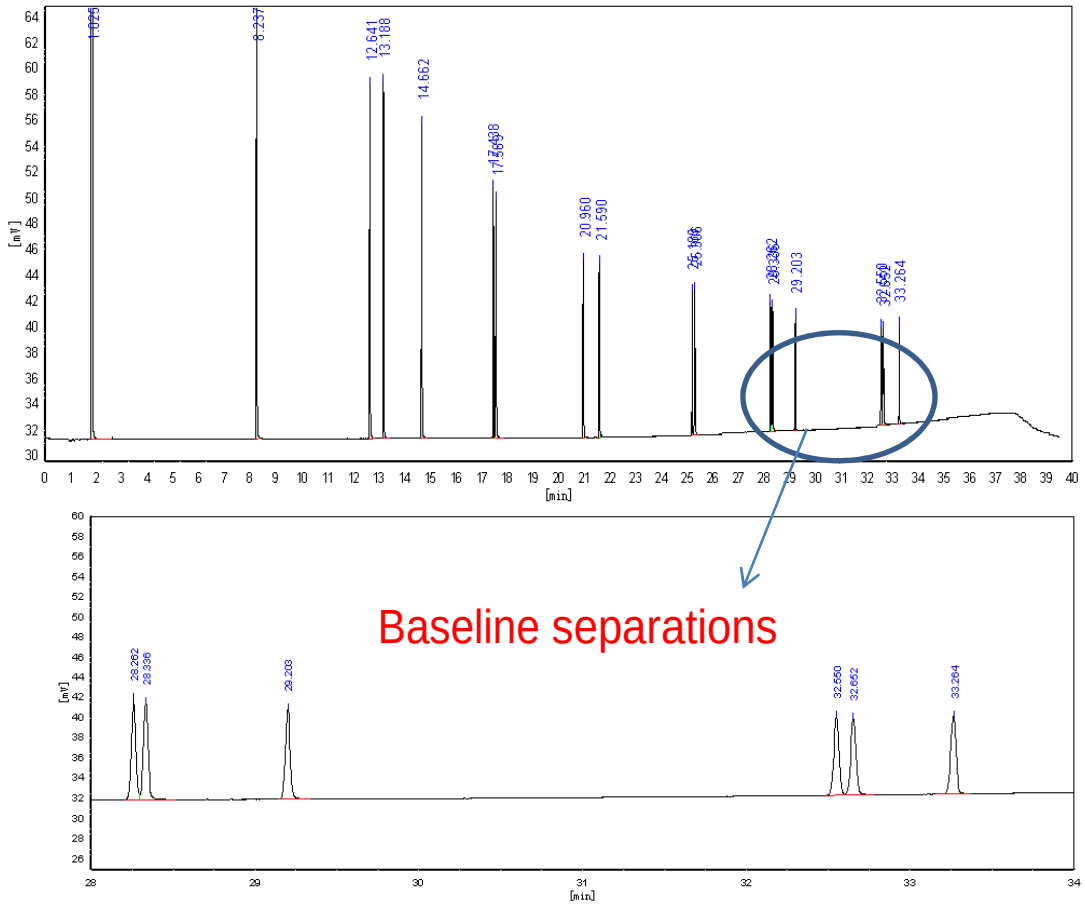
- Poly(Aromatic Hydrocarbons) are widely present in soils and sediments and being introduced to biological species through food chain. PAHs are toxic to all life species including human being. EU, US EPA and other international institute have established reliable, accurate and robust analytical standards and methods to accurately detect and measure PAH level in samples, mostly using GC or GC-MSD instrumentations
- One of challenges of PAH analyzing is the separation. Non-polar column such as 5-MS or mid-polar (increasing phenyl) columns are widely used. Non-polar columns sometime is misperceptioned as providing limited resolutions for a few pairs of PAHs. This limited separation can actually be improved with high efficiency columns with adequate retentions (oven temperature profile), as demonstrated by GS-Tek's results presented in the following

Instrumentation Conditions

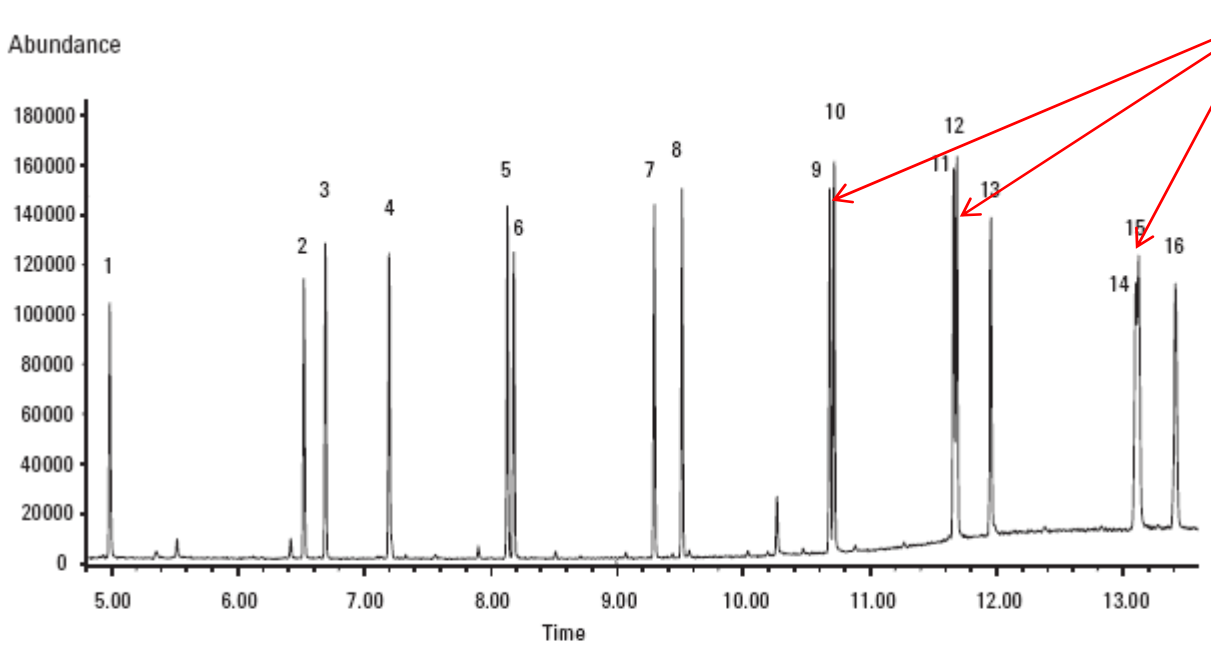
- GC: HP 5890 Series II w/ FID
- Column: GsBP-5MS, 40m x 0.18mm x 0.18um, cat no: 1518-4001
- Oven: 75C (1min) 8C/min to 285C (1min) 5C/min to 320C (3min)
- Carrier: Hydrogen, column flow 0.65ml/min
- Inlet: Split/splitless, 275C, split flow 60ml/min
- Detector: FID 350C
- Sample: 15+1 PAH standard, 0.2ul

15+1 PAH Separations on a GsBP-5MS Column

Peak Name	Retention time	Resolution
Naphthalene	8.237	
Acenaphthylene	12.641	
Acenaphthene	13.188	
Fluorene	14.662	
Phenanthrene	17.438	
anthracene	17.569	3.224
Fluoroanthene	20.96	
Pyrene	21.59	
Benz(a)anthracene	25.189	
Chrysene	25.306	2.723
Benzo(b)fluoranthene	28.262	
Benzo(k)fluoranthene	28.336	1.546
Benzo(a)pyrene	29.203	
Indeno(1,2,3-cd)pyrene	32.55	
Dibenz(a,h)anthracene	32.652	1.849
Benzo(g,h)perylene	33.264	



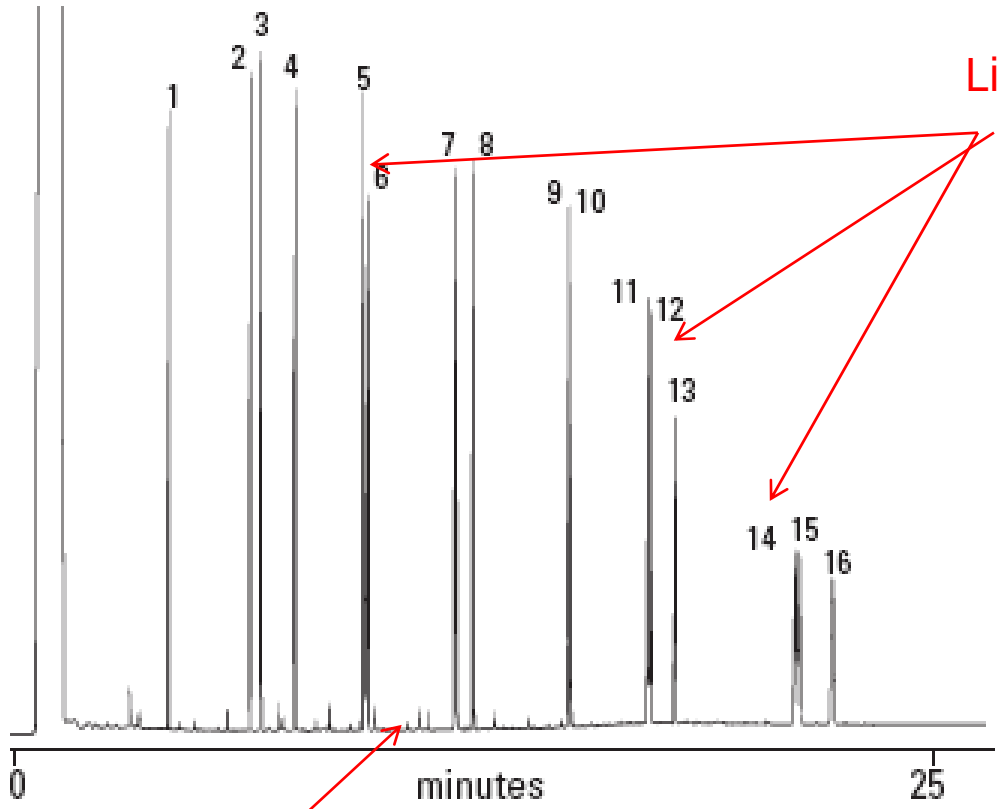
PAH Separations on a DB-5MS Column



Limited separations

1. Naphthalene
2. Acenaphthylene
3. Acenaphthene
4. Fluorene
5. Phenanthrene
6. Anthracene
7. Fluoranthene
8. Pyrene
9. Benz[a]anthracene
10. Chrysene
11. Benzo[b]fluoranthene
12. Benzo[k]fluoranthene
13. Benzo[a]pyrene
14. Indeno[1,2,3-cd]pyrene
15. Dibenz[a,h]anthracene
16. Benzo[g,h,i]perylene

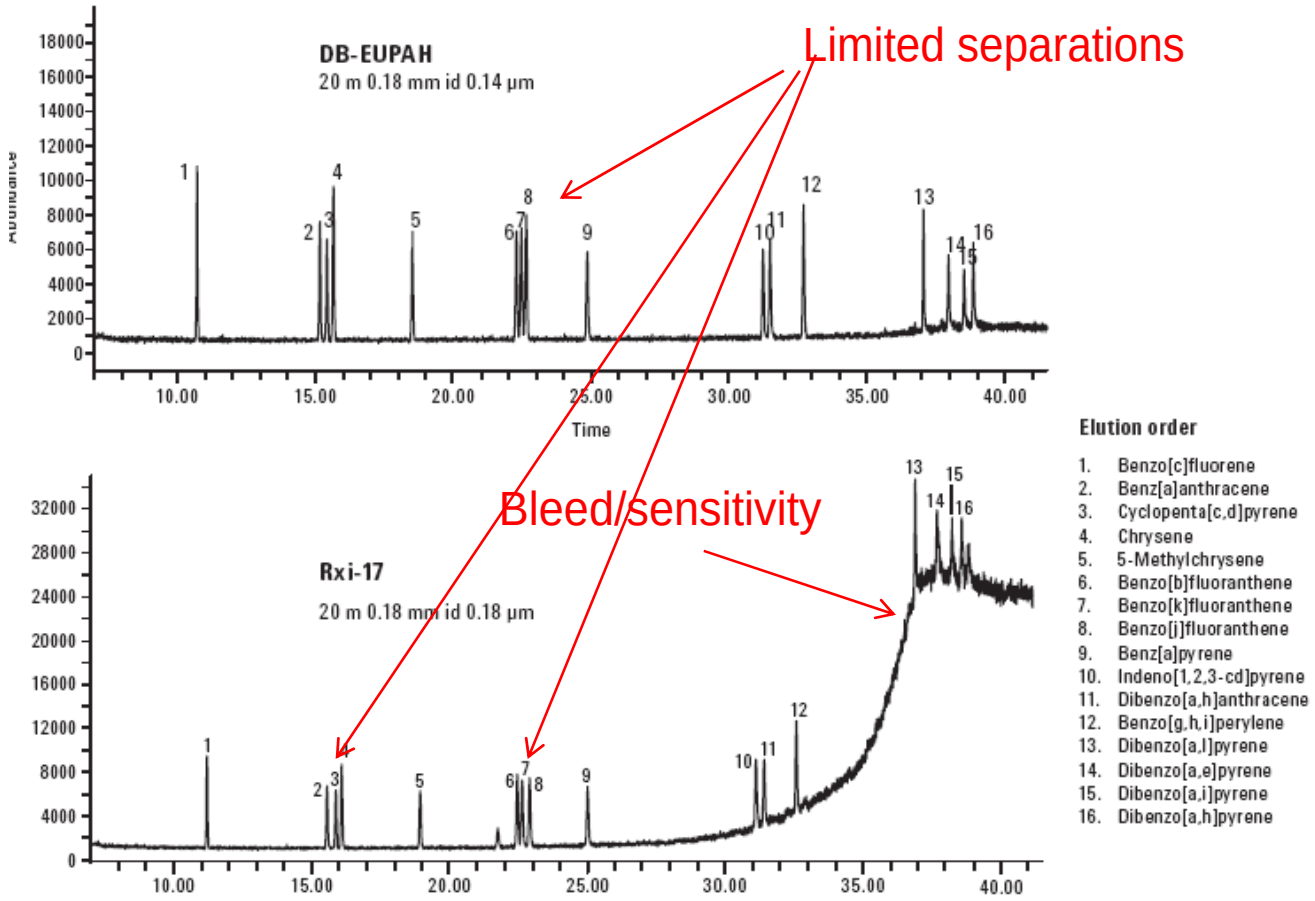
PAH Separations on a TR-5MS Column



Limited separations

Baseline noises

PAH Separations on Special Labeled PAH Columns



Conclusion

- The baseline separations of 15+1 PAH standards are achieved on a GSBP-5MS column
- The resolutions of critical separated pairs of PAH, namely, Indeno(1,2,3-cd)pyrene and Dibenz(a,h)anthracene(14/15), Benzo(b)fluoranthene and Benzo(k)fluoranthene (11/12) are improved over the published result on a DB-5MSUI or a TR-5MS column
- Using Non-polar column over mid-polar columns would be better as the column is less varied and more thermally stable, thus the analysis repeatability is ensured