

**Table 1** The yield products of anthracene and phenanthrene hydrogenation process in the presence of NiCo/chrysotile

| No.               | Individual chemical composition      | Anthracene | Phenanthrene |
|-------------------|--------------------------------------|------------|--------------|
| 1                 | 1-Methyl-2-(phenylmethyl)-benzene    | 3.51       | 0.20         |
| 2                 | 2-Ethyl-naphthalene                  | 1.38       | 1.10         |
| 3                 | 2-Butyl-naphthalene                  | 2.20       | 0.25         |
| 4                 | Biphenyl                             | -          | 0.40         |
| 5                 | 2-Methyl-1,1'-biphenyl               | 1.04       | -            |
| 6                 | 2-Ethyl-1,1'-biphenyl                | 6.95       | 0.37         |
| 7                 | Fluorene                             | -          | 2.75         |
| 8                 | 9-Methyl-9H-fluorene                 | -          | 0.90         |
| 9                 | 9,10-Dihydro-anthracene              | 24.83      | 2.82         |
| 10                | 1,2,3,4-Tetrahydro-anthracene        | 34.92      | 1.68         |
| 11                | 1,2,3,4,5,6,7,8-Octahydro-anthracene | 2.16       | -            |
| 12                | 9,10-Dihydro-phenanthrene            | -          | 13.45        |
| 13                | 1,2,3,4-Tetrahydro-phenanthrene      | -          | 4.09         |
| 14                | Anthracene                           | 14.65      | -            |
| 15                | Phenanthrene                         | 8.37       | 74.70        |
| 16                | Undefined                            | -          | 0.57         |
| <b>Conversion</b> |                                      | 76.99      | 28.60        |