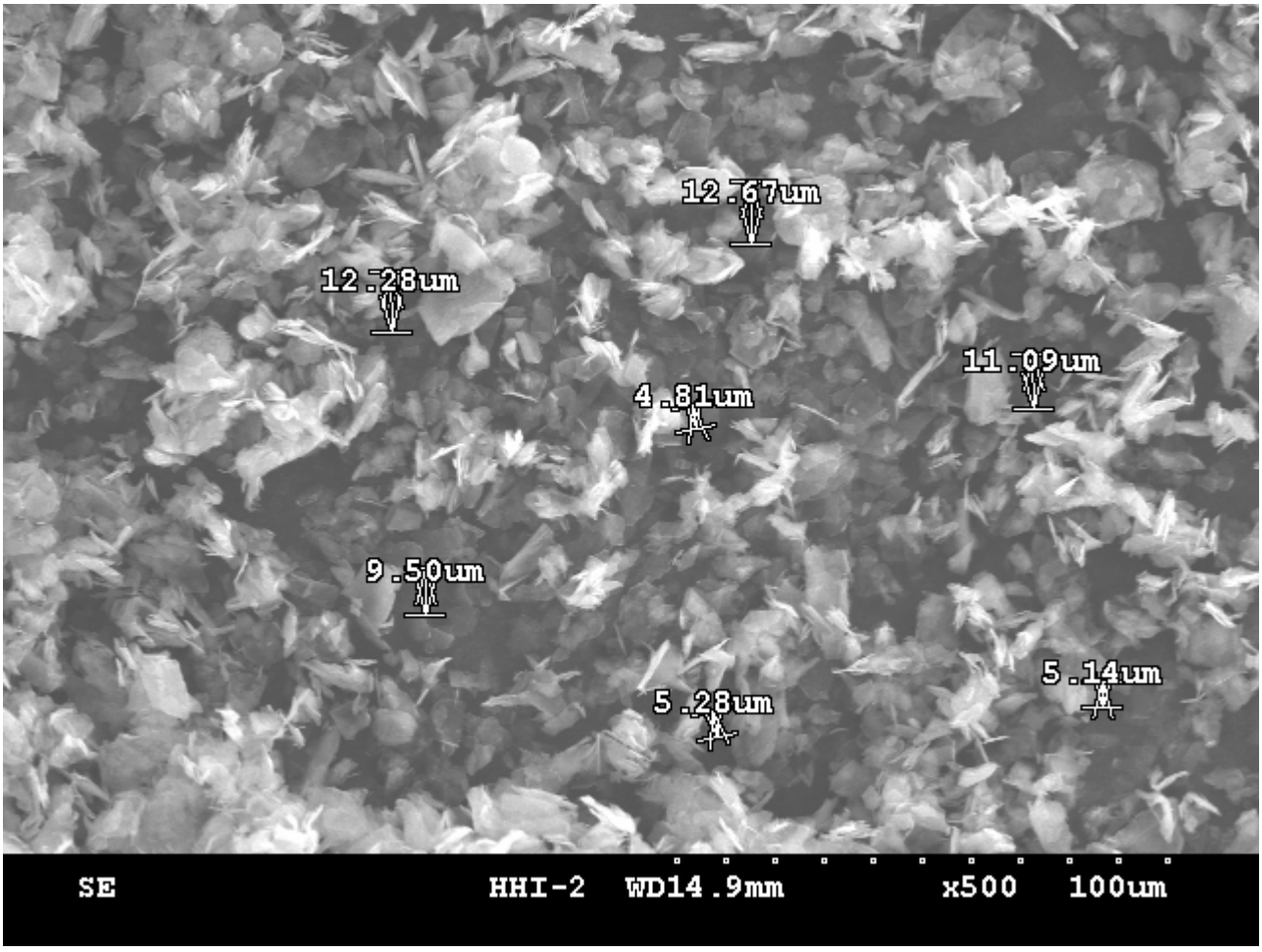
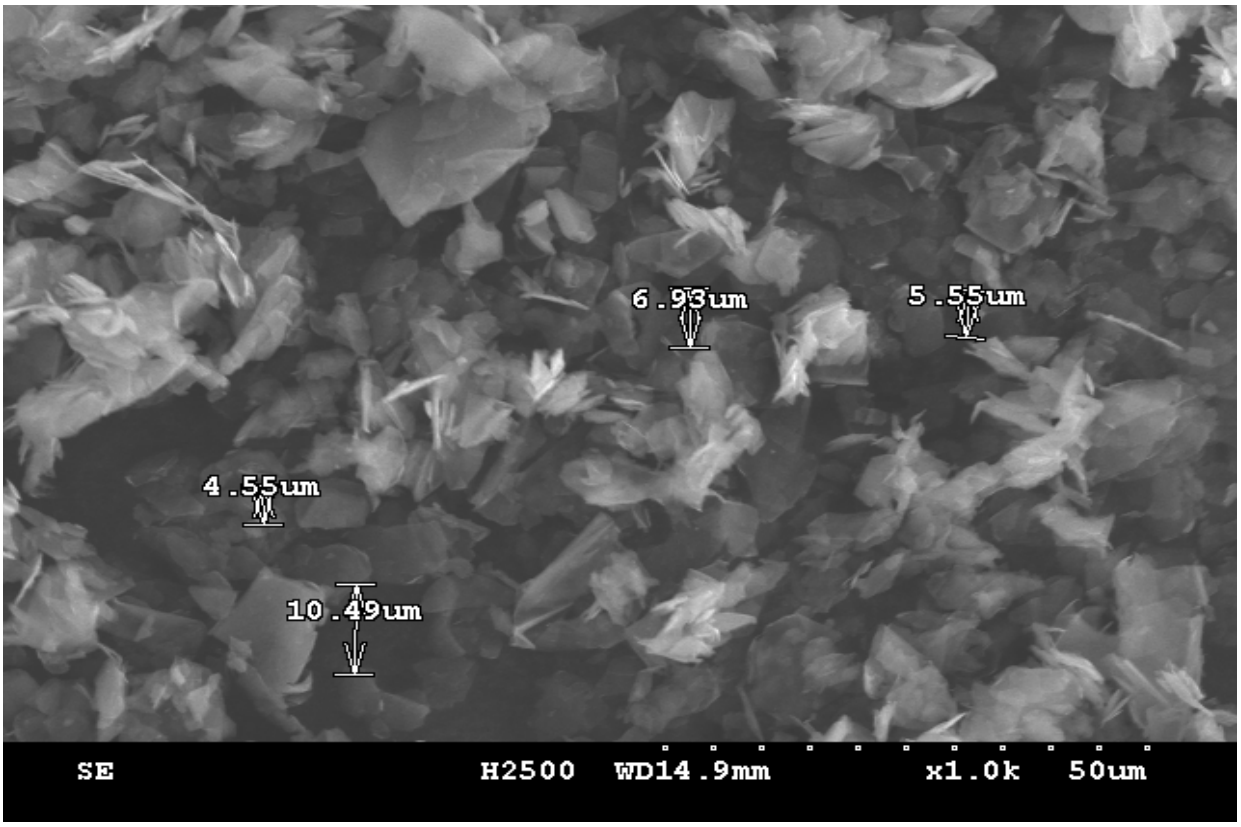
石墨粉材質報告(高溫潤滑導電粉)

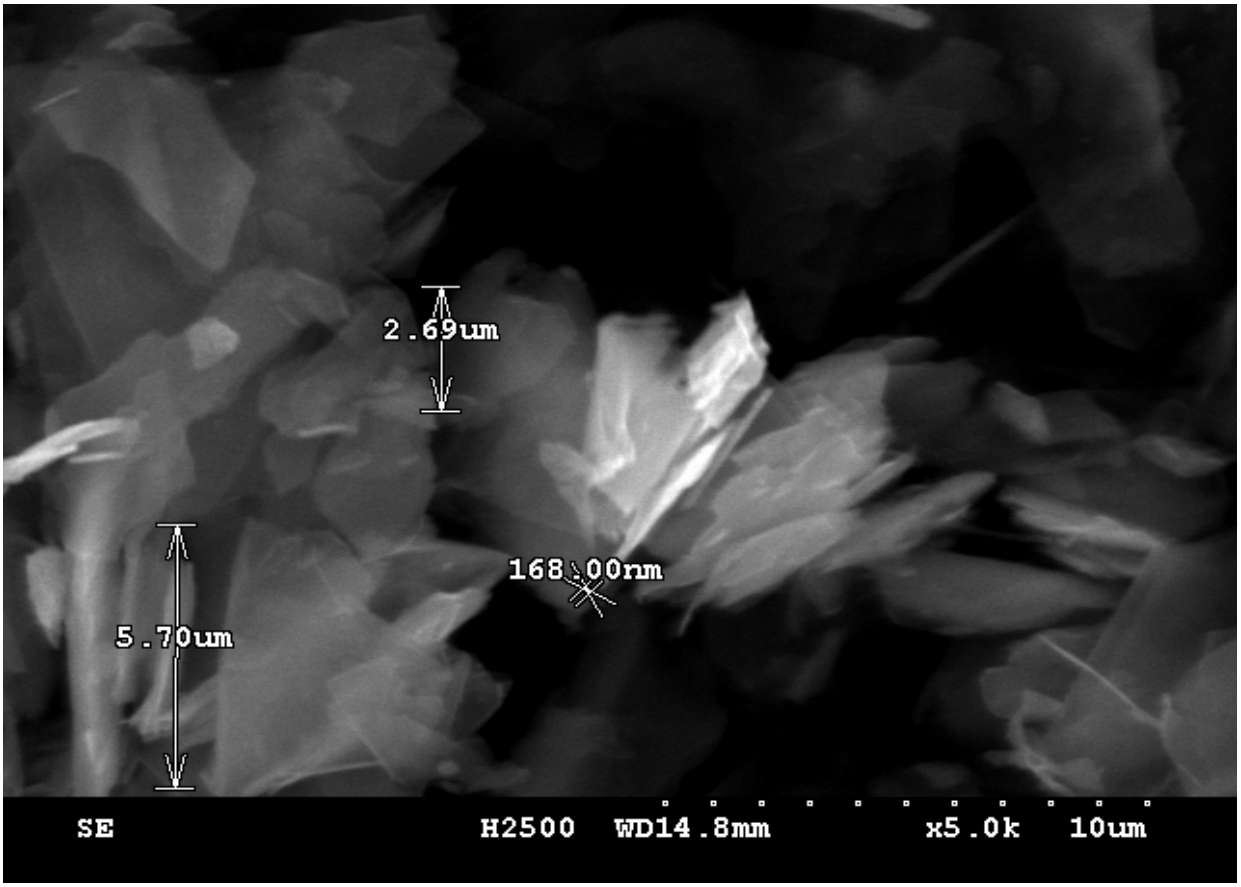
石墨粉主要成份即爲碳, 本報告皆使用 HITACHI S-3500N 掃描式電子顯微鏡拍攝, 2500 目石墨粉, 可知顆粒的粗細約在 4.55um 與 10.49um 之間, 主成分是 C(6) ,Si(14),Cr(24),可由圖四之 EDS 圖譜得知,其原始量測資料數據如附錄一 。圖五係放大 1000 倍拍攝 3.2micron 石墨粉, 主成分是 C(6) ,O(8),Al(13),Si(14),可由圖六之 EDS 圖譜得知,其原始量測資料數據如附錄二。圖七圖八係使用 HITACHI S-3500N 掃描式電子顯微鏡放大 1500 倍及 2000 倍所拍攝 3.2micron 石墨粉之顆粒部分, 可知顆粒的粗細約在 1.19um 與 7.79um 之間, 主成分是 C(6) ,O(8),Al(13),Si(14),可由圖九之 EDS 圖譜得知,其原始量測資料數據如附錄三 。 總括來說, 本公司所販售之 2500 目 高溫潤滑導電粉具有相當良好的材質純度, 其含炭量超過 99.9% 以上, 3.2micron 其純度則爲 94.4% 以上!



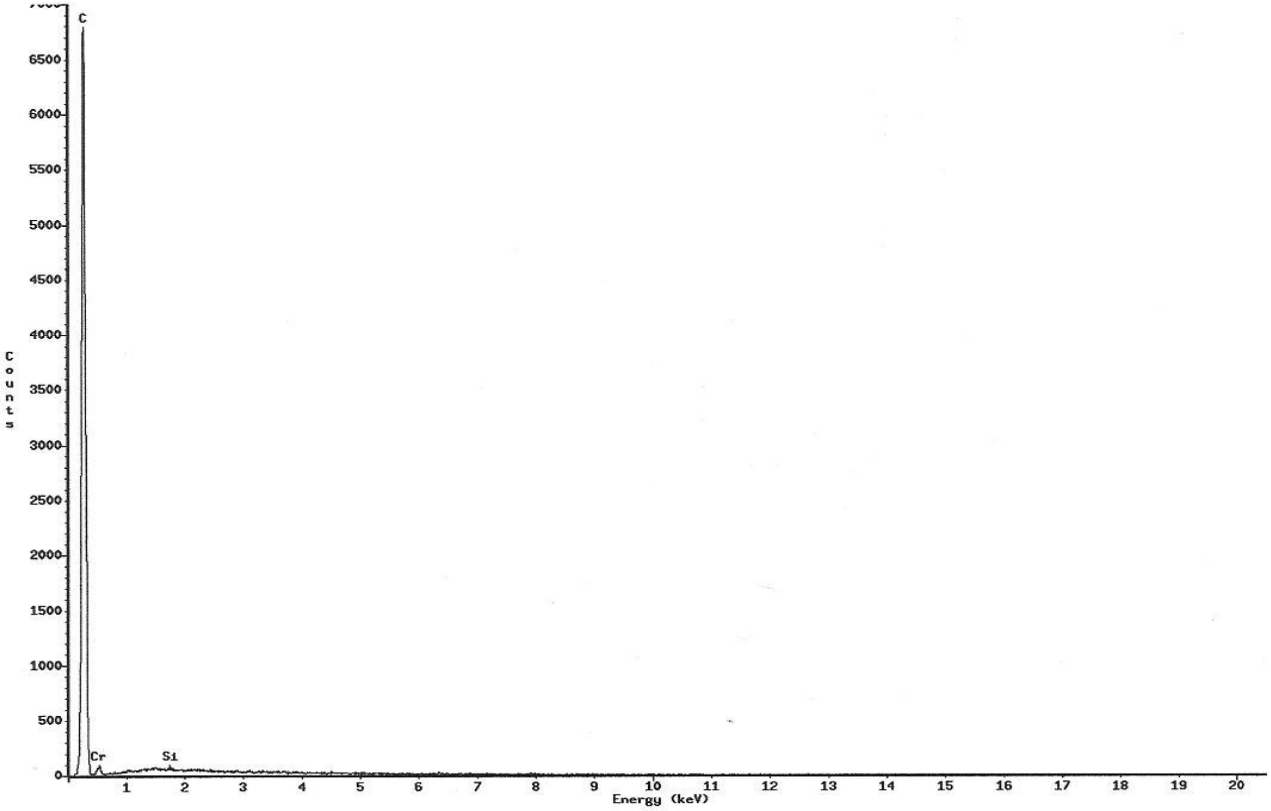
圖一 石墨粉 2500 目 電子顯微鏡(SEM) 500 倍放大圖



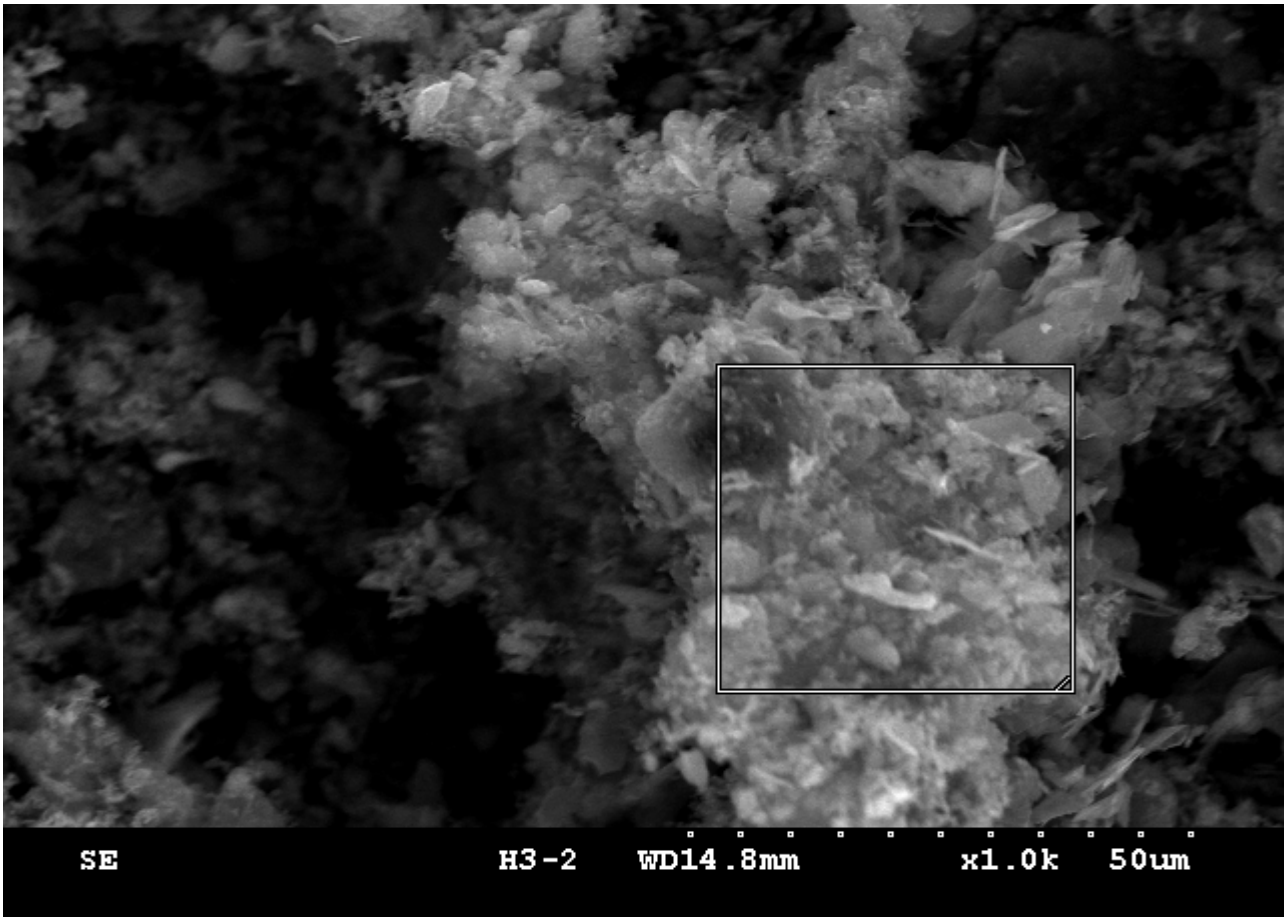
圖二 石墨粉 2500 目　電子顯微鏡(SEM) 1000 倍放大圖



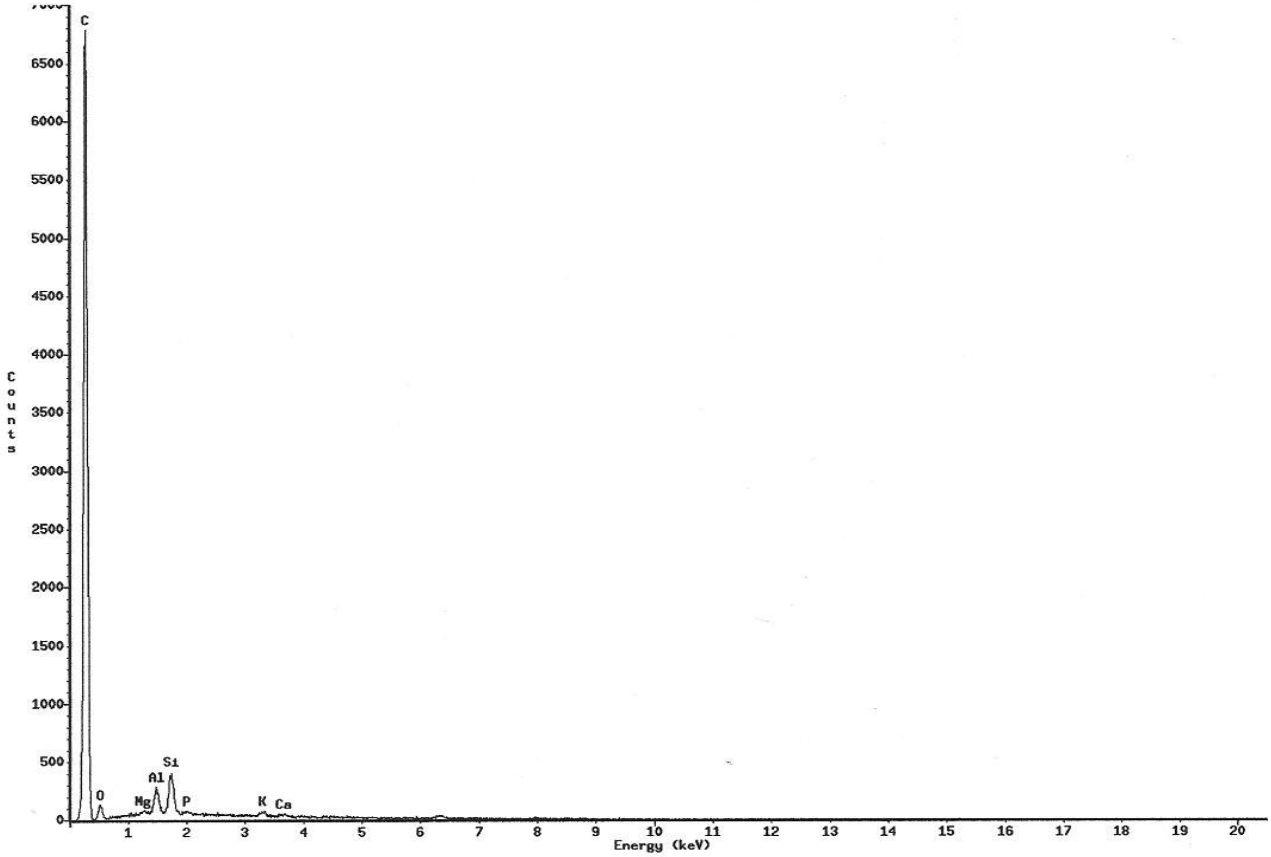
圖三 石墨粉 2500 目　電子顯微鏡(SEM) 5000 倍放大圖



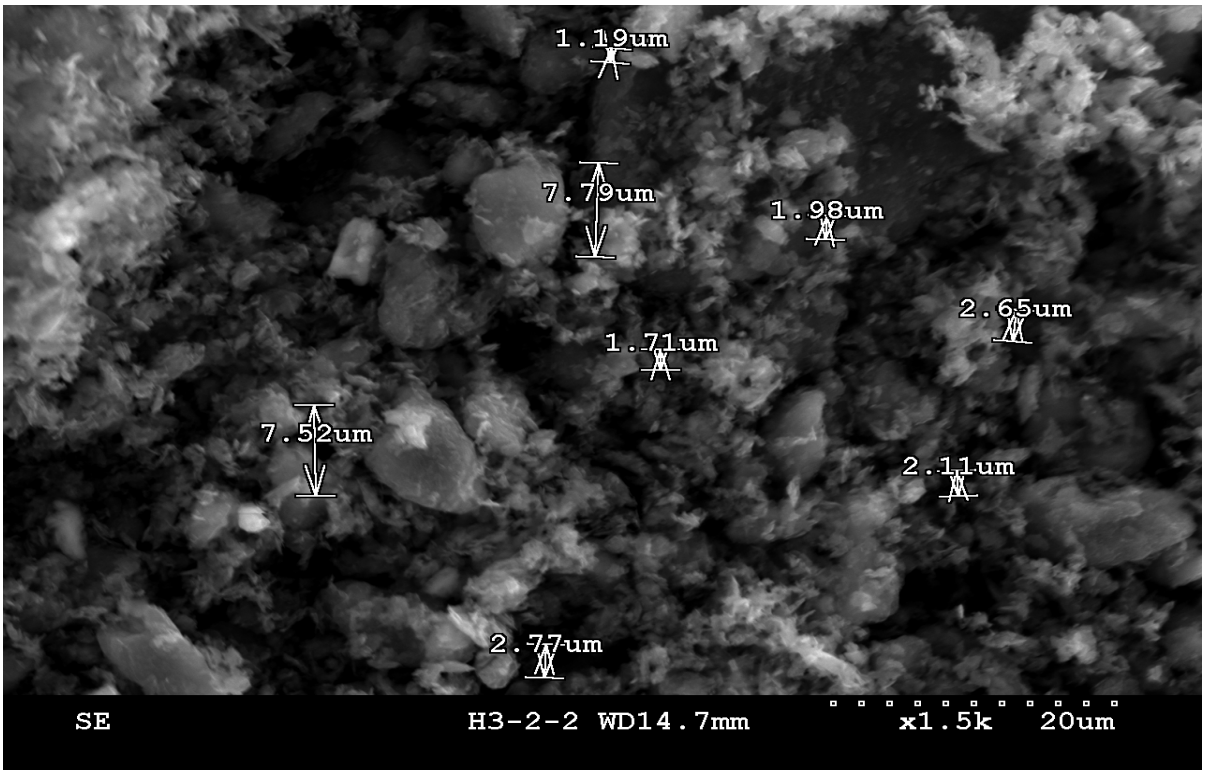
圖四 石墨粉 2500 目 材質分析圖(EDS)



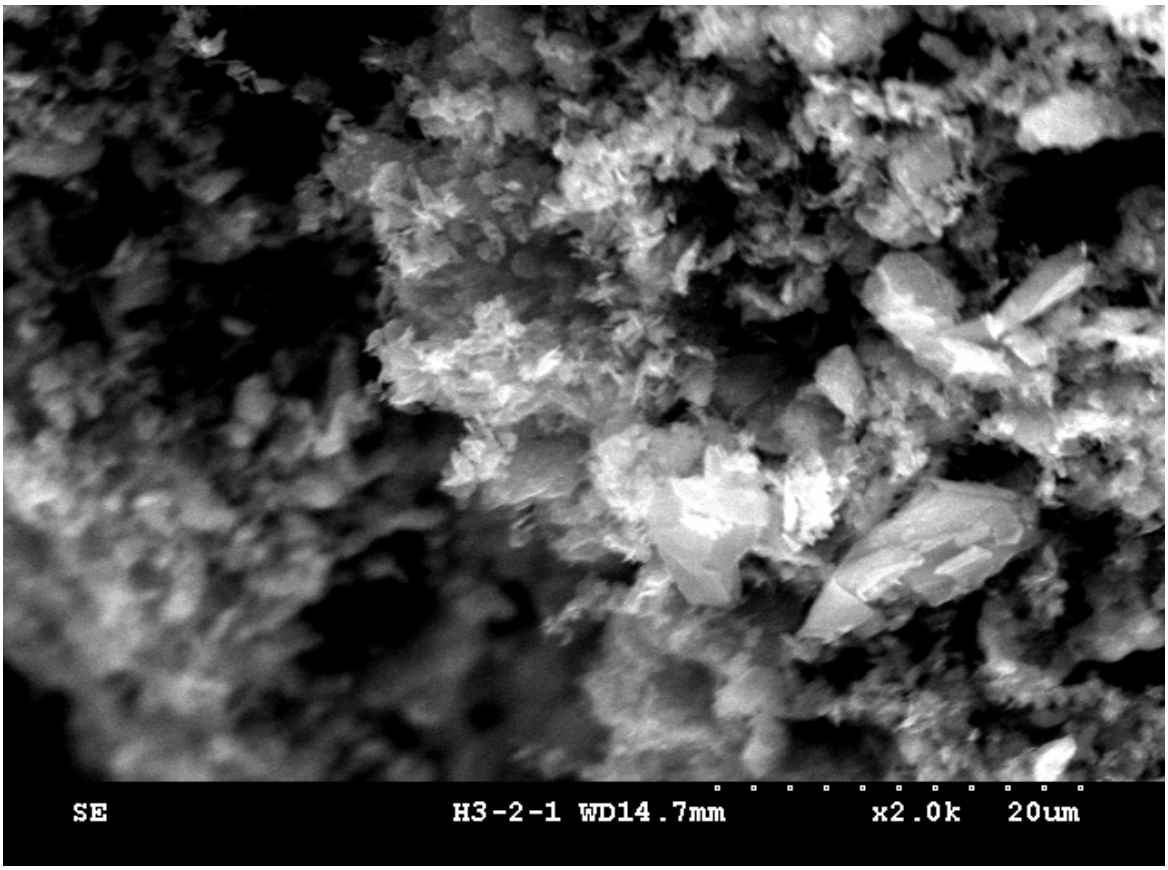
圖五 石墨粉 3.2micron 材質 電子顯微鏡放大圖 1000 倍



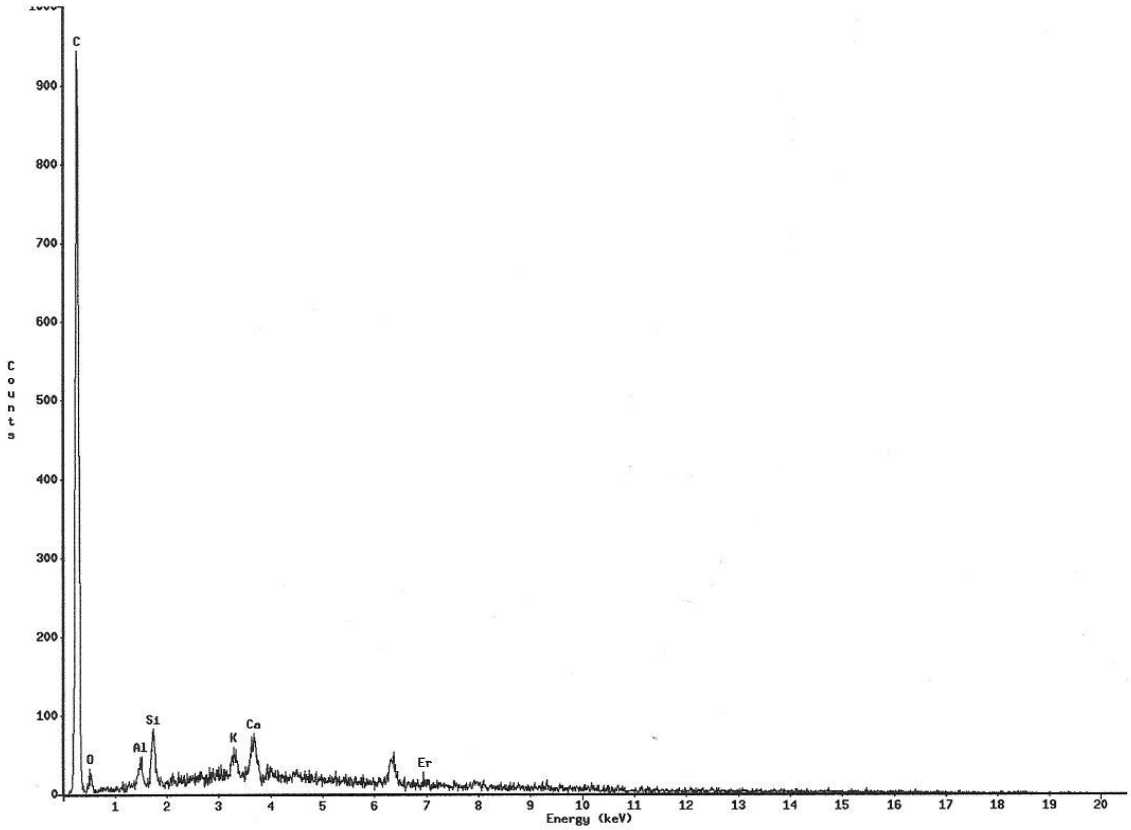
圖六 石墨粉 3.2micron 材質分析圖(EDS)



圖七 石墨粉 3.2micron 材質 電子顯微鏡放大圖 1500 倍



圖八 石墨粉 3.2micron 電子顯微鏡放大圖 2000 倍



圖九 石墨粉 3.2micron 材質分析圖(EDS)

附錄一　2500 目石墨粉之原始量測資料數據

```
Wed Nov 16 13:48:47 2005


Livetime : 100.0 Sec.
Technique: Least Squares Fit


  Elements Present:
        C(6), Si(14), Cr(24)

 Energy     Intensity    Elements
  (keV)      (counts)     Present
  0.272        50494      C  Ka
  0.529          527      Cr La1
  1.757          202      Si Ka


Wed Nov 16 13:51:27 2005


Refit _Cr-K' _Cr-K" _Cr-L' _Cr-L" _Si-K' _Si-K"
Filter Fit Method
Chi-sqd = 4.79     Livetime = 100.0 Sec.
Standardless Analysis
Element   Relative      Error          Net       Error
          k-ratio    (1-Sigma)      Counts   (1-Sigma)
  C -K    0.99894 +/- 0.00547       51335 +/-    281
  Cr-K    0.00000 +/- 0.00001           0 +/-      1
  Cr-L       ---         ---          298 +/-     42
  Si-K    0.00106 +/- 0.00026          162 +/-     39

Adjustment Factors           K           L           M
  Z-Balance:              0.00000     0.00000     0.00000
  Shell:                  1.00000     1.00000     1.00000

PROZA Correction  Acc.Volt.= 15 kV  Take-off Angle=35.00 deg
Number of Iterations = 25  *** Convergence Not Achieved ***

Element  k-ratio    ZAF    Atom %  Element  Wt % Err. Compound Compound
         (calc.)                    Wt %   (1-Sigma) Formula     Wt %
  C -K    0.1521   1.794    33.33   27.29    +/- 0.15   CO2       99.98
  Cr-K    0.0000   1.299     0.00    0.00    +/- 0.00   Cr         0.00
  Si-K    0.0002   1.351     0.01    0.02    +/- 0.01   Si         0.02
  O -K     ---     2.321    66.66   72.69 S     ---      ---       ---
  Total                     100.00  100.00                        100.00

   Table Symbols:  S -- Wt.% calculated by Stoichiometry
```

附錄二　3.2 micron 放大 1000 倍之原始量測資料數據

```
Wed Nov 16 10:31:07 2005


Livetime : 100.0 Sec.
Technique: Least Squares Fit


  Elements Present:
        C(6), O(8), Al(13), Si(14), K(19),
        Ca(20)
  Possible Additional Elements:
        Mg(12), P(15)

 Energy    Intensity   Elements   Elements
  (keV)     (counts)    Present   Possible
  0.272       49684     C  Ka
  0.520         908     O  Ka
 *1.258         187                Mg Ka
  1.483        2395     Al Ka
  1.735        3950     Si Ka
 *2.005         193                P  Ka
  3.303         462     K  Ka
  3.661         258     Ca Ka
  6.338         285     unidentified

 *  Check peak labels manually, or acquire additional data
    for better statistics and re-run Automatic Ident.


Wed Nov 16 10:33:29 2005


Refit _Ca-K' _Ca-K"
Refit _O -K'
Filter Fit Method
Chi-sqd = 6.00     Livetime = 100.0 Sec.
Standardless Analysis
Element   Relative     Error        Net      Error
          k-ratio    (1-Sigma)    Counts  (1-Sigma)
  C -K    0.94842 +/- 0.00521      50602 +/-   278
  O -K    0.00982 +/- 0.00074        611 +/-    46
  Al-K    0.01118 +/- 0.00056       1892 +/-    94
  Si-K    0.02161 +/- 0.00068       3415 +/-   108
  K -K    0.00597 +/- 0.00093        547 +/-    85
  Ca-K    0.00300 +/- 0.00051        241 +/-    41

Adjustment Factors           K           L           M
  Z-Balance:              0.00000     0.00000     0.00000
  Shell:                  1.00000     1.00000     1.00000

PROZA Correction  Acc.Volt.= 15 kV  Take-off Angle=35.00 deg
Number of Iterations = 7

Element  k-ratio    ZAF    Atom %  Element  Wt % Err.
         (calc.)                    Wt %   (1-Sigma)
  C -K    0.6779   1.345    94.46   91.16    +/- 0.50
  O -K    0.0070   7.246     3.96    5.09    +/- 0.38
  Al-K    0.0080   1.345     0.50    1.07    +/- 0.05
  Si-K    0.0154   1.235     0.85    1.91    +/- 0.06
  K -K    0.0043   1.209     0.16    0.52    +/- 0.08
  Ca-K    0.0021   1.189     0.08    0.26    +/- 0.04
```

附錄三 3.2 micron 放大 2000 倍之原始量測資料數據

```
Wed Nov 16 10:31:07 2005


Livetime : 100.0 Sec.
Technique: Least Squares Fit


  Elements Present:
        C(6), O(8), Al(13), Si(14), K(19),
        Ca(20)
  Possible Additional Elements:
        Mg(12), P(15)

 Energy     Intensity   Elements   Elements
  (keV)      (counts)    Present   Possible
  0.272         49684    C  Ka
  0.520           908    O  Ka
 *1.258           187                Mg Ka
  1.483          2395    Al Ka
  1.735          3950    Si Ka
 *2.005           193                P  Ka
  3.303           462    K  Ka
  3.661           258    Ca Ka
  6.338           285    unidentified

 *  Check peak labels manually, or acquire additional data
    for better statistics and re-run Automatic Ident.


Wed Nov 16 10:33:29 2005


Refit _Ca-K' _Ca-K"
Refit _O -K'
Filter Fit Method
Chi-sqd = 6.00      Livetime = 100.0 Sec.
Standardless Analysis
Element    Relative      Error          Net       Error
           k-ratio     (1-Sigma)      Counts   (1-Sigma)
  C -K     0.94842 +/- 0.00521        50602 +/-    278
  O -K     0.00982 +/- 0.00074          611 +/-     46
  Al-K     0.01118 +/- 0.00056         1892 +/-     94
  Si-K     0.02161 +/- 0.00068         3415 +/-    108
  K -K     0.00597 +/- 0.00093          547 +/-     85
  Ca-K     0.00300 +/- 0.00051          241 +/-     41

Adjustment Factors           K           L           M
  Z-Balance:              0.00000     0.00000     0.00000
  Shell:                  1.00000     1.00000     1.00000

PROZA Correction  Acc.Volt.= 15 kV  Take-off Angle=35.00 deg
Number of Iterations = 7

Element  k-ratio     ZAF    Atom %  Element   Wt % Err.
         (calc.)                     Wt %    (1-Sigma)
  C -K    0.6779   1.345    94.46    91.16     +/- 0.50
  O -K    0.0070   7.246     3.96     5.09     +/- 0.38
  Al-K    0.0080   1.345     0.50     1.07     +/- 0.05
  Si-K    0.0154   1.235     0.85     1.91     +/- 0.06
  K -K    0.0043   1.209     0.16     0.52     +/- 0.08
  Ca-K    0.0021   1.189     0.08     0.26     +/- 0.04

  Total                    100.00   100.00
```

※以上報告 特別感謝中央大學 超塑性實驗室 李雄老師 支持教導!!