

## **APPENDIX**

## APPENDIX I

Table 4.1: List of materials, instruments and manufacturers.

| no  | Material  | Model No. / Batch No. | manufacturer                         |
|-----|---|-----------------------|--------------------------------------|
| 1.  | Eclipse denture base material                               | 030204                | Dentsply,USA.                        |
| 2.  | Meliodont denture base material                             | A1397B-2              | Bayer. Dental div.,UK.               |
| 3.  | Probase Cold denture base material                          | D53289                | Ivoclar Vivadent Ltd., Liechtenstein |
| 4.  | Water bath for heat curing                                  | 4676                  | Acrydig 10,Manfredi                  |
| 5.  | Eclipse processing unit                                     | 95-0348-01            | Dentsply, USA                        |
| 6.  | Conditioning oven   | 904968                | Dentsply, USA                        |
| 7.  | Mitutoyo digital vernier caliper                            | BX 303                | Mitutoyo Ltd., Tokyo, Japan.         |
| 8.  | Grinding and polishing machine. Metaserv <sup>®</sup> 2000. | 45-28229              | Buehler Ltd, USA.                    |
| 9.  | Instron machine   | 4302                  | Instron Inc,Uk.                      |
| 10. | Shimadzu microhardness tester                               | HMV-2000              | Shimadzu Corp, Japan.                |
| 11. | Incubator, Memmert.   | ULM 400-800           | Memmert GmbH Co.KG., Germany.        |
| 12. | Electronic balance.   | TL-300                | Tanaka scale works Co.,Ltd. Japan.   |

## APPENDIX II

Table 4.2: Surface hardness (Vickers hardness) of light-polymerized urethane dimethacrylate polymer (Eclipse) when irradiated for 4 minutes.

| No of specimen | Irradiated surface | Non-irradiated surface |
|----------------|--------------------|------------------------|
| 1              | 18.5               | 16.2                   |
| 2              | 18.1               | 15.8                   |
| 3              | 18.1               | 16.4                   |
| 4              | 18.3               | 17.5                   |
| 5              | 19.0               | 16.6                   |
| 6              | 16.6               | 16.8                   |
| 7              | 18.4               | 16.8                   |
| 8              | 19.1               | 16.4                   |
| 9              | 16.5               | 17.2                   |
| 10             | 18.0               | 16.5                   |
| 11             | 17.9               | 16.8                   |
| 12             | 19.2               | 17.1                   |
| 13             | 18.2               | 16.4                   |
| 14             | 19.0               | 17.2                   |
| 15             | 16.8               | 16.0                   |

Table 4.3: t-Test: paired two sample for means (4 min irradiation time), comparing the surface hardness between two surfaces of Eclipse

|                              | Irradiation surface | Non-irradiation surface |
|------------------------------|---------------------|-------------------------|
| Mean                         | 18.11333333         | 16.64667                |
| Variance                     | 0.762666667         | 0.225524                |
| Observations                 | 15                  | 15                      |
| Pearson correlation          | 0.074173648         |                         |
| Hypothesized Mean Difference | 0                   |                         |
| df                           | 14                  |                         |
| t Stat                       | 5.9008595589        |                         |
| P(T<=t) one-tail             | 1.93114E-05         |                         |
| T Critical one-tail          | 1.761310115         |                         |
| P(T<=t) two-tail             | 3.86228E-05         |                         |
| T Critical two-tail          | 2.144786681         |                         |

Table 4.4: Surface hardness (Vickers hardness) of light-polymerized urethane dimethacrylate polymer (Eclipse) when irradiated for 6 minutes.

| No of specimen | Irradiated surface | Non-irradiated surface |
|----------------|--------------------|------------------------|
| 1              | 19.4               | 16.8                   |
| 2              | 18.2               | 15.5                   |
| 3              | 17.7               | 17.7                   |
| 4              | 19.0               | 15.8                   |
| 5              | 18.3               | 16.7                   |
| 6              | 17.5               | 17.6                   |
| 7              | 17.8               | 16.4                   |
| 8              | 18.1               | 17.2                   |
| 9              | 19.2               | 15.7                   |
| 10             | 18.5               | 16.3                   |
| 11             | 18.8               | 17.1                   |
| 12             | 17.9               | 15.8                   |
| 13             | 17.8               | 17.0                   |
| 14             | 19.1               | 15.9                   |
| 15             | 18.5               | 16.5                   |

Table 4.5: t-Test: paired two sample for means (6 min irradiation time), comparing the surface hardness between two surfaces of Eclipse

|                              | Irradiation suraface | Non-irradiation surface |
|------------------------------|----------------------|-------------------------|
| Mean                         | 18.38666667          | 16.53333                |
| Variance                     | 0.362666667          | 0.492381                |
| Observations                 | 15                   | 15                      |
| Pearson correlation          | -0.456948358         |                         |
| Hypothesized Mean Difference | 0                    |                         |
| df                           | 14                   |                         |
| t Stat                       | 6.442755024          |                         |
| P(T<=t) one-tail             | 7.70527E-06          |                         |
| T Critical one-tail          | 1.761310115          |                         |
| P(T<=t) two-tail             | 1.54105E-05          |                         |
| T Critical TWO-tail          | 2.144786681          |                         |

Table 4.6: Surface hardness (Vickers hardness) of light-polymerized urethane dimethacrylate polymer (Eclipse) when irradiated for 8 minutes.

| No of specimen | Irradiated surface | Non-irradiated surface |
|----------------|--------------------|------------------------|
| 1              | 18.6               | 17.5                   |
| 2              | 18.4               | 16.7                   |
| 3              | 17.9               | 17.1                   |
| 4              | 17.9               | 17.6                   |
| 5              | 18.3               | 18.2                   |
| 6              | 18.7               | 17.5                   |
| 7              | 18.2               | 18.2                   |
| 8              | 17.5               | 17.9                   |
| 9              | 18.9               | 18.1                   |
| 10             | 17.9               | 17.8                   |
| 11             | 18.3               | 18.5                   |
| 12             | 18.6               | 18.0                   |
| 13             | 18.0               | 17.9                   |
| 14             | 18.8               | 18.4                   |
| 15             | 17.9               | 18.2                   |

Table 4.7: t-Test: paired two sample for means (8 min irradiation time), comparing the surface hardness between two surfaces of Eclipse

|                              | Irradiation surface | Non-irradiation surface |
|------------------------------|---------------------|-------------------------|
| Mean                         | 18.26               | 17.84                   |
| Variance                     | 0.16542871          | 0.241143                |
| Observations                 | 15                  | 15                      |
| Pearson correlation          | 0.105142145         |                         |
| Hypothesized Mean Difference | 0                   |                         |
| df                           | 14                  |                         |
| t Stat                       | 2.694037303         |                         |
| P(T<=t) one-tail             | 0.008729649         |                         |
| T Critical one-tail          | 1.761310115         |                         |
| P(T<=t) two-tail             | 0.017459298         |                         |
| T Critical two-tail          | 2.144786681         |                         |

Table 4.8: Surface hardness (Vickers hardness) of light-polymerized urethane dimethacrylate polymer (Eclipse) when irradiated for 10 minutes.

| No of specimen | Irradiated surface | Non-irradiated surface |
|----------------|--------------------|------------------------|
| 1              | 20.2               | 19.0                   |
| 2              | 18.2               | 18.0                   |
| 3              | 19.4               | 20.1                   |
| 4              | 18.5               | 19.2                   |
| 5              | 19.5               | 19.1                   |
| 6              | 20.3               | 18.6                   |
| 7              | 19.8               | 19.7                   |
| 8              | 20.1               | 20.0                   |
| 9              | 18.4               | 19.1                   |
| 10             | 20.2               | 20.2                   |
| 11             | 19.0               | 19.5                   |
| 12             | 18.9               | 18.9                   |
| 13             | 18.8               | 18.8                   |
| 14             | 19.4               | 19.5                   |
| 15             | 19.9               | 18.5                   |

Table 4.9: t-Test: paired two sample for means (10 min irradiation time), comparing the surface hardness between two surfaces of Eclipse

|                              | Irradiation surface | Non-irradiation surface |
|------------------------------|---------------------|-------------------------|
| Mean                         | 19.37333333         | 19.19333                |
| Variance                     | 0.500666667         | 0.272095                |
| Observations                 | 15                  | 15                      |
| Pearson correlation          | 0.373672022         |                         |
| Hypothesized Mean Difference | 0                   |                         |
| df                           | 14                  |                         |
| t Stat                       | 0.827234984         |                         |
| P(T<=t) one-tail             | 0.210990316         |                         |
| T Critical one-tail          | 1.761310115         |                         |
| P(T<=t) two-tail             | 0.792128372         |                         |
| T Critical two-tail          | 2.144786681         |                         |

Table 4.10: Surface hardness (Vickers hardness) of light-polymerized urethane dimethacrylate polymer (Eclipse) when irradiated for 12 minutes.

| No of specimen | Irradiated surface | Non-irradiated surface |
|----------------|--------------------|------------------------|
| 1              | 19.5               | 18.8                   |
| 2              | 19.0               | 19.0                   |
| 3              | 19.4               | 19.7                   |
| 4              | 18.9               | 18.9                   |
| 5              | 18.6               | 18.7                   |
| 6              | 19.7               | 19.8                   |
| 7              | 19.6               | 19.1                   |
| 8              | 18.9               | 19.4                   |
| 9              | 19.4               | 19.6                   |
| 10             | 19.1               | 18.8                   |
| 11             | 18.6               | 19.9                   |
| 12             | 19.7               | 18.5                   |
| 13             | 18.7               | 20.1                   |
| 14             | 19.5               | 18.5                   |
| 15             | 20.1               | 19.1                   |

Table 4.11: t-Test: paired two sample for means (12 min irradiation time), comparing the surface hardness between two surfaces of Eclipse

|                              | Irradiation surface | Non-irradiation surface |
|------------------------------|---------------------|-------------------------|
| Mean                         | 19.24666667         | 19.19333                |
| Variance                     | 0.206952381         | 0.272095                |
| Observations                 | 15                  | 15                      |
| Pearson correlation          | -0.236390659        |                         |
| Hypothesized Mean Difference | 0                   |                         |
| df                           | 14                  |                         |
| t Stat                       | 0.268635345         |                         |
| P(T<=t) one-tail             | 0.396064186         |                         |
| T Critical one-tail          | 1.761310115         |                         |
| P(T<=t) two-tail             | 0.792128372         |                         |
| T Critical two-tail          | 2.144786681         |                         |

Table 4.12: Surface hardness (Vickers hardness) of light-polymerized urethane dimethacrylate polymer (Eclipse) when irradiated for 14 minutes.

| No of specimen | Irradiated surface | Non-irradiated surface |
|----------------|--------------------|------------------------|
| 1              | 20.4               | 19.3                   |
| 2              | 19.0               | 18.9                   |
| 3              | 18.6               | 18.4                   |
| 4              | 19.7               | 19.7                   |
| 5              | 18.6               | 19.0                   |
| 6              | 19.8               | 19.1                   |
| 7              | 18.8               | 18.7                   |
| 8              | 18.2               | 19.1                   |
| 9              | 19.0               | 18.5                   |
| 10             | 19.4               | 19.6                   |
| 11             | 18.6               | 19.1                   |
| 12             | 19.3               | 18.9                   |
| 13             | 18.9               | 18.6                   |
| 14             | 19.6               | 18.7                   |
| 15             | 18.8               | 19.0                   |

Table 4.13: t-Test: paired two sample for means (14 min irradiation time), comparing the surface hardness between two surfaces of Eclipse

|                              | Irradiation surface | Non-irradiation surface |
|------------------------------|---------------------|-------------------------|
| Mean                         | 19.11333333         | 18.97333                |
| Variance                     | 0.336952381         | 0.13781                 |
| Observations                 | 15                  | 15                      |
| Pearson correlation          | 0.426053222         |                         |
| Hypothesized Mean Difference | 0                   |                         |
| df                           | 14                  |                         |
| t Stat                       | 1.004894792         |                         |
| P(T<=t) one-tail             | 0.16600044          |                         |
| T Critical one-tail          | 1.761310115         |                         |
| P(T<=t) two-tail             | 0.33200088          |                         |
| T Critical two-tail          | 2.144786681         |                         |



Table 4.14: Surface hardness of three denture polymers (Vickers hardness)

| light-polymerized polymer<br>(Eclipse) | Heat-polymerized polymer<br>(Meliodent) | Chemical-polymerized<br>polymer (Probase Cold) |
|--|---|--|
| 20.2                                   | 16.9                                    | 16.3   |
| 18.2                                   | 17.2                                    | 16.4   |
| 19.4                                   | 17.3                                    | 16.2   |
| 18.5                                   | 17.5                                    | 15.6   |
| 19.5                                   | 17.5                                    | 16.3   |
| 20.3                                   | 16.6                                    | 15.9   |
| 19.8                                   | 17.1                                    | 16.1   |
| 20.1                                   | 16.9                                    | 15.9   |
| 18.4                                   | 16.5                                    | 16.1   |
| 20.2                                   | 17.4                                    | 15.9   |
| 19.0                                   | 17.2                                    | 16.1   |
| 18.9                                   | 17.5                                    | 15.2   |
| 18.8                                   | 16.3                                    | 16.6   |
| 19.4                                   | 16.6                                    | 16.1   |
| 19.9                                   | 17.0                                    | 15.8   |

Table 4.15: Test specimen dimension and the results of three-point flexural bending test of light-polymerized denture base polymer (Eclipse).

S.D = Standard deviation.

| Spec.no     | Size of specimens |            | Load at yield (Max.load) (K.N) | Displacement At yield (Max.load) (mm) | Flexural strength (MPa) | Flexural modulus (MPa) |
|-------------|-------------------|------------|--------------------------------|---------------------------------------|-------------------------|------------------------|
|             | Thickness (mm)    | Width (mm) |                                |                                       |                         |                        |
| 1           | 2.39              | 9.97       | 0.0799                         | 9.880                                 | 105.2                   | 2593                   |
| 2           | 2.42              | 9.94       | 0.715                          | 9.540                                 | 92.2                    | 2164                   |
| 3           | 2.41              | 10.34      | 0.0839                         | 10.910                                | 105.2                   | 2435                   |
| 4           | 2.40              | 9.99       | 0.0691                         | 7.890                                 | 90.1                    | 2475                   |
| 5           | 2.42              | 10.46      | 0.0871                         | 10.210                                | 106.7                   | 2541                   |
| 6           | 2.41              | 10.02      | 0.0776                         | 9.800                                 | 100.0                   | 2399                   |
| 7           | 2.52              | 9.77       | 0.0898                         | 10.240                                | 106.4                   | 2507                   |
| 8           | 2.33              | 10.13      | 0.0793                         | 10.580                                | 108.2                   | 2656                   |
| 9           | 2.31              | 10.11      | 0.0764                         | 11.430                                | 106.2                   | 2594                   |
| 10          | 2.30              | 10.19      | 0.0753                         | 10.810                                | 104.8                   | 2612                   |
| Mean<br>S.D |                   |            | 0.0790<br>0.0065               | 10.130<br>0.973                       | 102.5<br>6.4            | 2498<br>143            |

Table 4.16: Test specimen dimension and the results of three-point flexural bending test of heat-polymerized polymer (Meliodent).

S.D = Standard deviation.

| Spec.no     | Size of specimens |               | Load at yield<br>(Max.load)<br>(K.N) | Displacement<br>At yield<br>(Max.load)<br>(mm) | Flexural<br>strength<br>(MPa) | Flexural<br>modulus<br>(MPa) |
|-------------|-------------------|---------------|--------------------------------------|--|-------------------------------|------------------------------|
|             | Thickness<br>(mm) | Width<br>(mm) |                                      |  |                               |                              |
| 1           | 2.45              | 10.36         | 0.0593                               | 11.06  | 71.56                         | 1858                         |
| 2           | 2.36              | 10.00         | 0.0563                               | 11.22  | 75.75                         | 2052                         |
| 3           | 2.46              | 9.94          | 0.0647                               | 9.99   | 80.67                         | 2031                         |
| 4           | 2.57              | 10.07         | 0.0729                               | 10.44  | 82.19                         | 2011                         |
| 5           | 2.52              | 10.08         | 0.683                                | 9.11   | 80.06                         | 1979                         |
| 6           | 2.45              | 10.10         | 0.0620                               | 10.02  | 76.73                         | 1958                         |
| 7           | 2.52              | 10.12         | 0.0677                               | 9.27   | 78.96                         | 1953                         |
| 8           | 2.49              | 10.09         | 0.0654                               | 10.82  | 78.37                         | 1927                         |
| 9           | 2.42              | 10.04         | 0.0620                               | 10.55  | 79.11                         | 1954                         |
| 10          | 2.42              | 9.87          | 0.0580                               | 7.95   | 75.24                         | 1969                         |
| Mean<br>S.D |                   |               | 0.0637<br>0.0051                     | 10.04<br>1.02                                  | 77.86<br>3.11                 | 1969<br>55                   |

Table 4.17: The specimen dimension and the results of three-point flexural bending test of chemical-polymerized polymer (Probase Cold).

| Spec.no | Size Of spec   |            | Load at yield (Max.load) (K.N) | Displacement At yield (Max.load) (mm) | Flexural strength (MPa) | Flexural modulus (MPa) |
|---------|----------------|------------|--------------------------------|---------------------------------------|-------------------------|------------------------|
|         | Thickness (mm) | Width (mm) |                                |                                       |                         |                        |
| 1       | 2.41           | 9.8        | 0.0475                         | 8.940                                 | 62.61                   | 1815                   |
| 2       | 2.48           | 10.40      | 0.0616                         | 9.090                                 | 72.25                   | 1980                   |
| 3       | 2.52           | 9.79       | 0.0572                         | 7.710                                 | 68.99                   | 1939                   |
| 4       | 2.45           | 10.39      | 0.0514                         | 6.930                                 | 61.82                   | 1850                   |
| 5       | 2.53           | 9.76       | 0.0513                         | 8.790                                 | 61.56                   | 1749                   |
| 6       | 2.35           | 9.85       | 0.0414                         | 7.390                                 | 57.01                   | 1843                   |
| 7       | 2.3            | 10.11      | 0.0444                         | 8.530                                 | 62.31                   | 1908                   |
| 8       | 2.5            | 10.08      | 0.0520                         | 8.240                                 | 61.85                   | 1726                   |
| 9       | 2.50           | 10.08      | 0.0573                         | 7.900                                 | 63.75                   | 1780                   |
| 10      | 2.55           | 10.37      | 0.0432                         | 7.620                                 | 58.03                   | 1731                   |
| Mean    |                |            | 0.0507                         | 8.114                                 | 63.02                   | 18.32                  |
| S.D     |                |            | 0.0067                         | 0.720                                 | 4.57                    | 89                     |

S.D = Standard deviation.