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APPENDICES

Appendix A Characterization of Porous Scaffolds

Aliphatic polyesters, polycaprolactone (PCL), Poly(1,4-butylene succinate) extended with 1,6-diisocyanatohexane (PBSu-DCH), poly(lactic acid) (PLA), poly(3-hydroxybutyric acid) (PHB), and poly(3-hydroxybutyric acid-co-3-hydroxyvaleric acid) (PHBV), were fabricated into three-dimensional porous scaffolds by solvent casting and salt particulate leaching method at 30:1 NaCl/polymer weight ratio. Raw data of density, porosity, pore volume and pore size of the porous scaffolds were shown in Table A1, A2, A3 and A4, respectively.

Table A1 Raw data of density of porous scaffolds

| Scaffolds | Density (g/cm ³) | | | | | | |
|-----------|------------------------------|--------|--------|--------|--------|---------|-------|
| | 1 | 2 | 3 | 4 | 5 | Average | SD |
| PCL | 0.0666 | 0.0748 | 0.0711 | 0.0732 | 0.0644 | 0.070 | 0.004 |
| PBSu-DCH | 0.0564 | 0.0633 | 0.0685 | 0.0637 | 0.0846 | 0.067 | 0.011 |
| PLA | 0.0598 | 0.0529 | 0.0602 | 0.0605 | 0.0592 | 0.059 | 0.003 |
| PHB | 0.0570 | 0.0594 | 0.0577 | 0.0594 | 0.0571 | 0.058 | 0.001 |
| PHBV | 0.0575 | 0.0572 | 0.0575 | 0.0563 | 0.0557 | 0.057 | 0.001 |

The porosity and pore volume of the scaffolds were calculated using the following equation.

$$Porosity(\%) = \left(1 - \frac{\rho_{scaffold}}{\rho_{polymer}} \right) \times 100$$

$$Pore\ volume = \left(\frac{1}{\rho_{scaffold}} - \frac{1}{\rho_{polymer}} \right) \times 100$$

where $\rho_{scaffold}$ is the apparent density of the porous scaffolds and $\rho_{polymer}$ is the density of the non-porous polymer. ($\rho_{polymer}$ of PCL = 1.145, PBSu-DCH = 1.3, PLA = 1.25, PHB = 1.121 and PHBV = 1.051)

Table A2 Raw data of porosity of porous scaffolds

| Scaffolds | Porosity (%) | | | | | | |
|-----------|--------------|-------|-------|-------|-------|---------|------|
| | 1 | 2 | 3 | 4 | 5 | Average | SD |
| PCL | 94.19 | 93.47 | 93.79 | 93.60 | 94.37 | 93.88 | 0.38 |
| PBSu-DCH | 95.66 | 95.13 | 94.73 | 95.10 | 93.49 | 94.82 | 0.81 |
| PLA | 95.22 | 95.77 | 95.18 | 95.16 | 95.27 | 95.32 | 0.25 |
| PHB | 94.91 | 94.70 | 94.86 | 94.70 | 94.91 | 94.82 | 0.11 |
| PHBV | 94.53 | 94.55 | 94.52 | 94.64 | 94.70 | 94.59 | 0.08 |

Table A3 Raw data of pore volume of porous scaffolds

| Scaffolds | Pore Volume (cm ³ /g) | | | | | | |
|-----------|----------------------------------|-------|-------|-------|-------|---------|------|
| | 1 | 2 | 3 | 4 | 5 | Average | SD |
| PCL | 14.15 | 13.36 | 14.06 | 13.66 | 15.52 | 14.15 | 0.83 |
| PBSu-DCH | 16.95 | 15.79 | 14.59 | 15.71 | 11.82 | 14.97 | 1.95 |
| PLA | 15.92 | 18.90 | 16.61 | 16.54 | 16.91 | 16.98 | 1.13 |
| PHB | 16.65 | 16.83 | 16.84 | 17.51 | 17.34 | 17.03 | 0.37 |
| PHBV | 16.45 | 17.47 | 17.38 | 17.77 | 17.94 | 17.40 | 0.58 |

Pore size of the scaffold was measured on the SEM micrograph with the UTHSCSA Image Tool version 3.0 software. The average values were calculated from the total 25 pores and accepted as the mean pore sizes.

Table A4 Raw data of pore size of porous scaffolds

| Pore Size (μm) | | | | | |
|-----------------------------|--------|----------|--------|--------|--------|
| | PCL | PBSu-DCH | PLA | PHB | PHBV |
| 1 | 414.56 | 340.66 | 449.31 | 397.46 | 430.12 |
| 2 | 525.83 | 449.41 | 436.31 | 389.71 | 453.13 |
| 3 | 468.96 | 377.66 | 434.17 | 472.05 | 445.4 |
| 4 | 424.88 | 461.57 | 436.5 | 450.45 | 648.64 |
| 5 | 311.04 | 420.66 | 395.14 | 449.85 | 452.09 |
| 6 | 391 | 434.9 | 484.87 | 351.47 | 438.82 |
| 7 | 396.93 | 369.73 | 436.89 | 457.14 | 544.44 |
| 8 | 400.57 | 449.58 | 509.34 | 356.12 | 474.36 |
| 9 | 443.39 | 359.15 | 366.13 | 437.85 | 481.9 |
| 10 | 482.16 | 401.32 | 391.24 | 403.26 | 418.3 |
| 11 | 431.45 | 456.06 | 376.76 | 371.98 | 413.3 |
| 12 | 394.36 | 378.79 | 490.32 | 386.83 | 461.06 |
| 13 | 462.39 | 421.74 | 347.71 | 392.48 | 375.92 |
| 14 | 396.49 | 440.08 | 519.03 | 534.71 | 402.19 |
| 15 | 462.1 | 381.38 | 430.92 | 514.27 | 432.07 |
| 16 | 375.42 | 404.65 | 509.45 | 513.61 | 401.77 |
| 17 | 403.82 | 479.63 | 424.39 | 469.8 | 434.92 |
| 18 | 462.65 | 438.23 | 480.66 | 486.07 | 403.33 |
| 19 | 432.98 | 443.29 | 423.37 | 420.48 | 471.99 |
| 20 | 440.91 | 450.81 | 477.27 | 536.78 | 361.39 |
| 21 | 359.6 | 408.26 | 346.02 | 368.61 | 591.29 |
| 22 | 379.75 | 525.96 | 265.4 | 385.57 | 325.52 |
| 23 | 402.16 | 453.52 | 408.56 | 367.16 | 470.18 |
| 24 | 381.09 | 430.9 | 407.32 | 382.1 | 410.21 |
| 25 | 363.25 | 478.26 | 463.95 | 481.81 | 419.7 |
| Average | 416.31 | 426.25 | 428.44 | 431.1 | 446.48 |
| SD | 46.21 | 42.77 | 59.58 | 58.08 | 68.39 |

The water absorbability is a factor to evaluate the degradation of the porous scaffolds. The five types of scaffolds were weighted and then were immersed in 5 ml of 0.1M PBS solution at room temperature for 10 days. The water absorption was calculated by use the following equation.

$$\text{Water absorption (\%)} = \frac{(M_{\text{wet}} - M_{\text{dry}})}{M_{\text{wet}}} \times 100$$

where M_{dry} and M_{wet} are the weight of the scaffold before and after immersion in water respectively. Five measurements were performed for the calculation of an average water absorption value. Raw data of weight of porous scaffolds at different time was shown in Table A5 and raw data of water absorption (%) of porous scaffolds at different time was shown in Table A6.

Table A5 Raw data of weight of porous scaffolds at different time

| Sample | M_{dry} | Weight at time (h) | | | | | | | | | | | | | | |
|-----------|-----------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | 0.42 | 1 | 2 | 4 | 6 | 8 | 10 | 24 | 48 | 72 | 96 | 120 | 144 | 192 | 240 |
| PCL 1 | 0.0301 | 0.1599 | 0.1881 | 0.2101 | 0.2034 | 0.2204 | 0.2321 | 0.2461 | 0.2613 | 0.2681 | 0.2686 | 0.2762 | 0.2750 | 0.2872 | 0.2762 | 0.3019 |
| PCL 2 | 0.0307 | 0.2574 | 0.2878 | 0.3186 | 0.3456 | 0.3489 | 0.3564 | 0.2565 | 0.3653 | 0.3655 | 0.3691 | 0.3833 | 0.3888 | 0.3752 | 0.3914 | 0.3914 |
| PCL 3 | 0.0313 | 0.2457 | 0.2862 | 0.3012 | 0.3218 | 0.3249 | 0.3239 | 0.3287 | 0.3397 | 0.3464 | 0.3451 | 0.3408 | 0.3488 | 0.3525 | 0.3537 | 0.3518 |
| PCL 4 | 0.0309 | 0.1487 | 0.1539 | 0.1685 | 0.2074 | 0.2063 | 0.2136 | 0.2326 | 0.2446 | 0.2503 | 0.2493 | 0.2537 | 0.2633 | 0.2492 | 0.2686 | 0.2588 |
| PCL 5 | 0.0308 | 0.1489 | 0.1699 | 0.1849 | 0.2090 | 0.2058 | 0.2263 | 0.2579 | 0.2605 | 0.2757 | 0.2667 | 0.2770 | 0.2714 | 0.2856 | 0.2714 | 0.2736 |
| PBSu-DCH1 | 0.0335 | 0.1730 | 0.2365 | 0.2865 | 0.3834 | 0.3934 | 0.4074 | 0.4338 | 0.4283 | 0.4436 | 0.4520 | 0.4352 | 0.4576 | 0.4348 | 0.4310 | 0.4362 |
| PBSu-DCH2 | 0.0331 | 0.1559 | 0.2178 | 0.3206 | 0.3800 | 0.4105 | 0.4129 | 0.4398 | 0.4547 | 0.4639 | 0.4630 | 0.4643 | 0.4651 | 0.4617 | 0.4616 | 0.4573 |
| PBSu-DCH3 | 0.0334 | 0.2086 | 0.2567 | 0.3014 | 0.3356 | 0.3285 | 0.3430 | 0.3711 | 0.3793 | 0.3970 | 0.3939 | 0.3985 | 0.3958 | 0.4042 | 0.4138 | 0.4209 |
| PBSu-DCH4 | 0.0334 | 0.1759 | 0.2074 | 0.2875 | 0.3593 | 0.3969 | 0.4081 | 0.4148 | 0.4265 | 0.4362 | 0.4469 | 0.4452 | 0.4378 | 0.4441 | 0.4445 | 0.4612 |
| PBSu-DCH5 | 0.0329 | 0.1698 | 0.1940 | 0.2964 | 0.3142 | 0.3405 | 0.3686 | 0.3612 | 0.3739 | 0.4010 | 0.3886 | 0.4008 | 0.3960 | 0.4050 | 0.4003 | 0.4041 |
| PLA 1 | 0.0331 | 0.1990 | 0.2212 | 0.2532 | 0.2804 | 0.2713 | 0.2646 | 0.2779 | 0.2881 | 0.3005 | 0.2949 | 0.3006 | 0.2979 | 0.3008 | 0.3009 | 0.3037 |
| PLA 2 | 0.0347 | 0.1175 | 0.1219 | 0.1492 | 0.1456 | 0.1991 | 0.2147 | 0.2183 | 0.2119 | 0.2321 | 0.2235 | 0.2310 | 0.2367 | 0.2269 | 0.2481 | 0.2375 |
| PLA 3 | 0.0400 | 0.1280 | 0.1255 | 0.1794 | 0.2201 | 0.2422 | 0.2529 | 0.2737 | 0.2615 | 0.2780 | 0.2786 | 0.2920 | 0.2648 | 0.2881 | 0.2797 | 0.2979 |
| PLA 4 | 0.0281 | 0.1039 | 0.1112 | 0.1403 | 0.1667 | 0.1895 | 0.2124 | 0.2017 | 0.2118 | 0.2185 | 0.2174 | 0.2201 | 0.2216 | 0.2269 | 0.2236 | 0.2294 |
| PLA 5 | 0.0271 | 0.1724 | 0.2120 | 0.2417 | 0.2505 | 0.2693 | 0.2766 | 0.2836 | 0.2909 | 0.3071 | 0.3060 | 0.2960 | 0.2944 | 0.2956 | 0.2991 | 0.2977 |
| PHB 1 | 0.0318 | 0.0979 | 0.0922 | 0.0983 | 0.1658 | 0.1662 | 0.2199 | 0.2183 | 0.2528 | 0.2516 | 0.2597 | 0.2582 | 0.2524 | 0.2668 | 0.2894 | 0.2823 |
| PHB 2 | 0.0306 | 0.0930 | 0.1240 | 0.1510 | 0.1761 | 0.1573 | 0.1959 | 0.2085 | 0.2154 | 0.2260 | 0.2172 | 0.2346 | 0.2225 | 0.2288 | 0.2501 | 0.2576 |
| PHB 3 | 0.0321 | 0.1330 | 0.1589 | 0.1839 | 0.2035 | 0.2332 | 0.2457 | 0.2491 | 0.2670 | 0.2766 | 0.2970 | 0.3003 | 0.2958 | 0.2925 | 0.3055 | 0.3034 |
| PHB 4 | 0.0318 | 0.0841 | 0.0915 | 0.1140 | 0.1203 | 0.1247 | 0.1683 | 0.1627 | 0.2266 | 0.2162 | 0.2329 | 0.2381 | 0.2375 | 0.2460 | 0.2365 | 0.2435 |
| PHB 5 | 0.0317 | 0.1325 | 0.1734 | 0.1700 | 0.1792 | 0.2018 | 0.2019 | 0.2205 | 0.2313 | 0.2469 | 0.2567 | 0.2481 | 0.2726 | 0.2532 | 0.2476 | 0.2585 |
| PHBV 1 | 0.0274 | 0.1807 | 0.4944 | 0.5013 | 0.4868 | 0.4919 | 0.4876 | 0.4851 | 0.5009 | 0.5007 | 0.4842 | 0.4805 | 0.4794 | 0.4770 | 0.4594 | 0.4586 |
| PHBV 2 | 0.0281 | 0.1672 | 0.2396 | 0.3333 | 0.3919 | 0.4157 | 0.4135 | 0.4115 | 0.4184 | 0.4131 | 0.4154 | 0.4281 | 0.4110 | 0.4135 | 0.3997 | 0.4022 |
| PHBV 3 | 0.0331 | 0.2226 | 0.4542 | 0.5031 | 0.5003 | 0.5408 | 0.5577 | 0.5626 | 0.5589 | 0.5575 | 0.5560 | 0.5627 | 0.5424 | 0.5197 | 0.5197 | 0.5081 |
| PHBV 4 | 0.0309 | 0.2735 | 0.3257 | 0.4608 | 0.5186 | 0.5268 | 0.5242 | 0.5191 | 0.5357 | 0.5265 | 0.5204 | 0.5071 | 0.5138 | 0.5065 | 0.5047 | 0.4981 |
| PHBV 5 | 0.0326 | 0.2101 | 0.4521 | 0.4862 | 0.4792 | 0.5072 | 0.5073 | 0.5106 | 0.5405 | 0.5469 | 0.5212 | 0.5191 | 0.5065 | 0.4994 | 0.4849 | 0.4746 |

Table A6 Raw data of water absorption (%) of porous scaffolds at different time

| Sample | Water absorption (%) | | | | | | | | | | | | | | |
|------------|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 0.42 | 1 | 2 | 4 | 6 | 8 | 10 | 24 | 48 | 72 | 96 | 120 | 144 | 192 | 240 |
| PCL 1 | 81.18 | 84.00 | 85.68 | 85.20 | 86.35 | 87.03 | 87.77 | 88.48 | 88.77 | 88.80 | 89.10 | 89.06 | 89.52 | 89.10 | 90.03 |
| PCL 2 | 88.09 | 89.35 | 90.38 | 91.13 | 91.21 | 91.40 | 88.05 | 91.61 | 91.61 | 91.69 | 92.00 | 92.11 | 91.83 | 92.17 | 92.17 |
| PCL 3 | 87.28 | 89.08 | 89.62 | 90.29 | 90.38 | 90.35 | 90.49 | 90.80 | 90.97 | 90.94 | 90.83 | 91.04 | 91.13 | 91.16 | 91.11 |
| PCL 4 | 79.21 | 79.91 | 81.66 | 85.09 | 85.02 | 85.53 | 86.71 | 87.36 | 87.65 | 87.60 | 87.82 | 88.26 | 87.60 | 88.49 | 88.06 |
| PCL 5 | 79.32 | 81.88 | 83.35 | 85.27 | 85.04 | 86.39 | 88.06 | 88.18 | 88.83 | 88.46 | 88.88 | 88.65 | 89.22 | 88.65 | 88.74 |
| Average | 83.02 | 84.84 | 86.14 | 87.40 | 87.60 | 88.14 | 88.22 | 89.29 | 89.57 | 89.50 | 89.73 | 89.82 | 89.86 | 89.91 | 90.02 |
| SD | 4.34 | 4.24 | 3.81 | 3.04 | 2.98 | 2.58 | 1.39 | 1.82 | 1.66 | 1.74 | 1.67 | 1.67 | 1.67 | 1.65 | 1.68 |
| PBSu-DCH 1 | 80.67 | 85.86 | 88.32 | 91.28 | 91.50 | 91.79 | 92.29 | 92.19 | 92.46 | 92.60 | 92.31 | 92.69 | 92.31 | 92.24 | 92.33 |
| PBSu-DCH 2 | 78.76 | 84.80 | 89.67 | 91.29 | 91.94 | 91.98 | 92.47 | 92.72 | 92.86 | 92.85 | 92.87 | 92.88 | 92.83 | 92.83 | 92.76 |
| PBSu-DCH 3 | 83.98 | 86.98 | 88.91 | 90.04 | 89.83 | 90.26 | 90.99 | 91.19 | 91.58 | 91.51 | 91.61 | 91.56 | 91.73 | 91.92 | 92.06 |
| PBSu-DCH 4 | 81.00 | 83.88 | 88.37 | 90.70 | 91.58 | 91.81 | 91.94 | 92.16 | 92.34 | 92.52 | 92.49 | 92.36 | 92.47 | 92.48 | 92.75 |
| PBSu-DCH 5 | 80.63 | 83.04 | 88.90 | 89.53 | 90.34 | 91.07 | 90.89 | 91.20 | 91.80 | 91.53 | 91.79 | 91.69 | 91.88 | 91.78 | 91.86 |
| Average | 81.01 | 84.91 | 88.84 | 90.57 | 91.03 | 91.38 | 91.72 | 91.89 | 92.21 | 92.20 | 92.22 | 92.24 | 92.24 | 92.25 | 92.35 |
| SD | 1.88 | 1.56 | 0.54 | 0.77 | 0.90 | 0.72 | 0.73 | 0.67 | 0.52 | 0.63 | 0.51 | 0.59 | 0.45 | 0.42 | 0.40 |
| PLA 1 | 83.35 | 85.01 | 86.91 | 88.18 | 87.78 | 87.48 | 88.08 | 88.50 | 88.97 | 88.76 | 88.98 | 88.88 | 88.98 | 88.98 | 89.09 |
| PLA 2 | 70.44 | 71.50 | 76.72 | 76.14 | 82.56 | 83.82 | 84.09 | 83.61 | 85.04 | 84.46 | 84.96 | 85.32 | 84.69 | 86.00 | 85.38 |
| PLA 3 | 68.79 | 68.16 | 77.72 | 81.84 | 83.50 | 84.20 | 85.40 | 84.72 | 85.62 | 85.66 | 86.32 | 84.91 | 86.13 | 85.71 | 86.59 |
| PLA 4 | 72.98 | 74.76 | 80.00 | 83.17 | 85.19 | 86.79 | 86.09 | 86.75 | 87.16 | 87.09 | 87.25 | 87.34 | 87.63 | 87.45 | 87.77 |
| PLA 5 | 84.30 | 87.23 | 88.80 | 89.20 | 89.95 | 90.22 | 90.46 | 90.70 | 91.19 | 91.16 | 90.86 | 90.81 | 90.84 | 90.95 | 90.91 |
| Average | 75.97 | 77.33 | 82.03 | 83.71 | 85.80 | 86.50 | 86.82 | 86.85 | 87.60 | 87.43 | 87.67 | 87.45 | 87.66 | 87.82 | 87.95 |
| SD | 7.33 | 8.39 | 5.49 | 5.27 | 3.05 | 2.61 | 2.49 | 2.85 | 2.52 | 2.63 | 2.30 | 2.46 | 2.40 | 2.18 | 2.16 |
| PHB 1 | 67.51 | 65.49 | 67.66 | 80.82 | 80.87 | 85.54 | 85.43 | 87.42 | 87.36 | 87.76 | 87.68 | 87.40 | 88.08 | 89.01 | 88.74 |
| PHB 2 | 67.12 | 75.34 | 79.75 | 82.64 | 80.57 | 84.39 | 85.34 | 85.81 | 86.48 | 85.93 | 86.97 | 86.26 | 86.64 | 87.78 | 88.13 |
| PHB 3 | 75.87 | 79.79 | 82.55 | 84.23 | 86.24 | 86.93 | 87.11 | 87.98 | 88.39 | 89.19 | 89.31 | 89.15 | 89.03 | 89.49 | 89.42 |
| PHB 4 | 62.16 | 65.24 | 72.09 | 73.55 | 74.49 | 81.10 | 80.45 | 85.96 | 85.29 | 86.34 | 86.64 | 86.61 | 87.07 | 86.55 | 86.94 |
| PHB 5 | 76.05 | 81.70 | 81.33 | 82.29 | 84.27 | 84.28 | 85.61 | 86.28 | 87.14 | 87.63 | 87.20 | 88.36 | 87.46 | 87.18 | 87.72 |
| Average | 69.74 | 73.51 | 76.68 | 80.71 | 81.29 | 84.45 | 84.79 | 86.69 | 86.93 | 87.37 | 87.56 | 87.55 | 87.66 | 88.00 | 88.19 |
| SD | 6.06 | 7.79 | 6.48 | 4.18 | 4.48 | 2.16 | 2.53 | 0.96 | 1.15 | 1.29 | 1.05 | 1.20 | 0.93 | 1.23 | 0.95 |
| PHBV 1 | 84.84 | 94.46 | 94.53 | 94.37 | 94.43 | 94.38 | 94.35 | 94.53 | 94.53 | 94.34 | 94.30 | 94.28 | 94.26 | 94.04 | 94.02 |
| PHBV 2 | 83.18 | 88.26 | 91.56 | 92.82 | 93.23 | 93.20 | 93.16 | 93.28 | 93.19 | 93.23 | 93.43 | 93.16 | 93.20 | 92.96 | 93.01 |
| PHBV 3 | 85.14 | 92.71 | 93.42 | 93.39 | 93.88 | 94.07 | 94.12 | 94.08 | 94.06 | 94.05 | 94.12 | 93.90 | 93.63 | 93.63 | 93.49 |
| PHBV 4 | 88.69 | 90.50 | 93.29 | 94.03 | 94.13 | 94.10 | 94.04 | 94.22 | 94.12 | 94.05 | 93.90 | 93.98 | 93.89 | 93.87 | 93.79 |
| PHBV 5 | 84.48 | 92.79 | 93.29 | 93.19 | 93.57 | 93.57 | 93.61 | 93.97 | 94.04 | 93.74 | 93.72 | 93.56 | 93.47 | 93.27 | 93.13 |
| Average | 85.26 | 91.74 | 93.22 | 93.56 | 93.85 | 93.86 | 93.86 | 94.02 | 93.99 | 93.88 | 93.89 | 93.78 | 93.69 | 93.55 | 93.49 |
| SD | 2.05 | 2.40 | 1.06 | 0.63 | 0.47 | 0.47 | 0.47 | 0.46 | 0.49 | 0.42 | 0.34 | 0.43 | 0.40 | 0.44 | 0.43 |

Appendix B Degradation of Porous Scaffolds

The *in vitro* degradation of biodegradable scaffolds was assessed in two different environments under only PBS and *Pseudomonas* lipase in PBS conditions. In this study, the 5 types of three dimensional porous scaffolds and incubation times were examined to observe a change in degradation rate. Remaining weight, mechanical property, thermal property and morphological property were evaluated.

The scaffold remaining weight was measured and calculated by the following equation.

$$\text{Remaining weight (\%)} = \frac{W_t}{W_0} \times 100$$

Table B1 Remaining Weight of degraded scaffolds in PBS solution at 37°C

| Time (week) | Remaining Weight (%) | | | | | | | | | |
|-------------|----------------------|------|----------|-------|---------|------|---------|-------|---------|------|
| | PCL | | PBSu-DCH | | PLA | | PHB | | PHBV | |
| | average | SD | average | SD | average | SD | average | SD | average | SD |
| 1 | 101.23 | 0.28 | 100.58 | 3.82 | 98.04 | 0.16 | 99.79 | 0.55 | 100.52 | 0.23 |
| 3 | 99.84 | 0.17 | 96.26 | 5.73 | 97.83 | 0.27 | 93.03 | 5.21 | 100.85 | 0.19 |
| 5 | 100.14 | 0.24 | 90.70 | 3.77 | 97.77 | 0.46 | 90.99 | 1.08 | 100.92 | 0.62 |
| 7 | 99.32 | 0.47 | 86.77 | 2.89 | 98.04 | 0.75 | 82.66 | 13.59 | 99.41 | 0.32 |
| 9 | 100.20 | 0.46 | 70.67 | 6.80 | 97.50 | 0.25 | 78.37 | 8.55 | 99.45 | 0.69 |
| 11 | 100.17 | 0.42 | 66.74 | 7.50 | 96.03 | 1.76 | 75.64 | 10.45 | 99.72 | 1.05 |
| 13 | 99.10 | 1.83 | 57.50 | 13.92 | 95.81 | 1.59 | 63.90 | 5.86 | 99.92 | 5.16 |

Table B2 Remaining Weight of degraded scaffolds in lipase/PBS solution at 37°C

| Time (week) | Remaining Weight (%) | | | | | | | | | |
|-------------|----------------------|------|----------|------|---------|------|---------|------|---------|------|
| | PCL | | PBSu-DCH | | PLA | | PHB | | PHBV | |
| | average | SD | average | SD | average | SD | average | SD | average | SD |
| 1 | 99.33 | 0.30 | 99.63 | 2.38 | 99.07 | 0.15 | 100.22 | 0.41 | 100.85 | 0.30 |
| 3 | 95.62 | 0.98 | 93.66 | 2.54 | 98.54 | 0.26 | 100.36 | 0.32 | 100.71 | 0.27 |
| 5 | 92.28 | 0.60 | 85.18 | 4.15 | 97.84 | 0.97 | 99.10 | 0.33 | 100.60 | 0.61 |
| 7 | 88.73 | 0.95 | 68.27 | 4.55 | 95.53 | 0.55 | 96.78 | 0.60 | 99.30 | 0.28 |
| 9 | 78.74 | 5.41 | 61.97 | 5.63 | 91.97 | 0.74 | 89.18 | 3.65 | 96.64 | 3.91 |
| 11 | 69.87 | 3.98 | 59.81 | 7.87 | 89.02 | 2.71 | 80.21 | 5.32 | 90.31 | 5.35 |
| 13 | 57.86 | 3.44 | 54.78 | 8.83 | 89.14 | 1.91 | 70.18 | 6.87 | 73.65 | 3.46 |

Table B3 Compressive modulus of degraded scaffolds in PBS solution

| Time (week) | Compressive Modulus (KPa) | | | | | | | | | |
|-------------|---------------------------|------|----------|------|---------|-------|---------|-------|---------|-------|
| | PCL | | PBSu-DCH | | PLA | | PHB | | PHBV | |
| | average | SD | average | SD | average | SD | average | SD | average | SD |
| 0 | 39.90 | 5.55 | 67.43 | 8.90 | 164.94 | 10.89 | 98.83 | 14.76 | 109.38 | 11.42 |
| 1 | Nd | Nd | Nd | Nd | 157.44 | 14.81 | 42.22 | 9.55 | 103.30 | 10.90 |
| 3 | 38.49 | 4.51 | 53.11 | 9.00 | 152.44 | 16.33 | 36.12 | 5.40 | 98.53 | 15.57 |
| 5 | 37.84 | 4.52 | 32.91 | 7.32 | 152.22 | 7.15 | 35.54 | 4.93 | 92.82 | 17.19 |
| 7 | 35.18 | 3.01 | 27.71 | 8.30 | 152.06 | 9.59 | 34.86 | 8.92 | 88.12 | 21.90 |
| 9 | 34.90 | 8.30 | * | * | 149.24 | 13.50 | 33.65 | 8.04 | 86.08 | 21.87 |
| 11 | 33.09 | 7.50 | * | * | 134.56 | 12.36 | 20.07 | 3.33 | 84.89 | 9.24 |
| 13 | 26.33 | 3.51 | * | * | 123.25 | 16.13 | * | * | 71.51 | 6.66 |

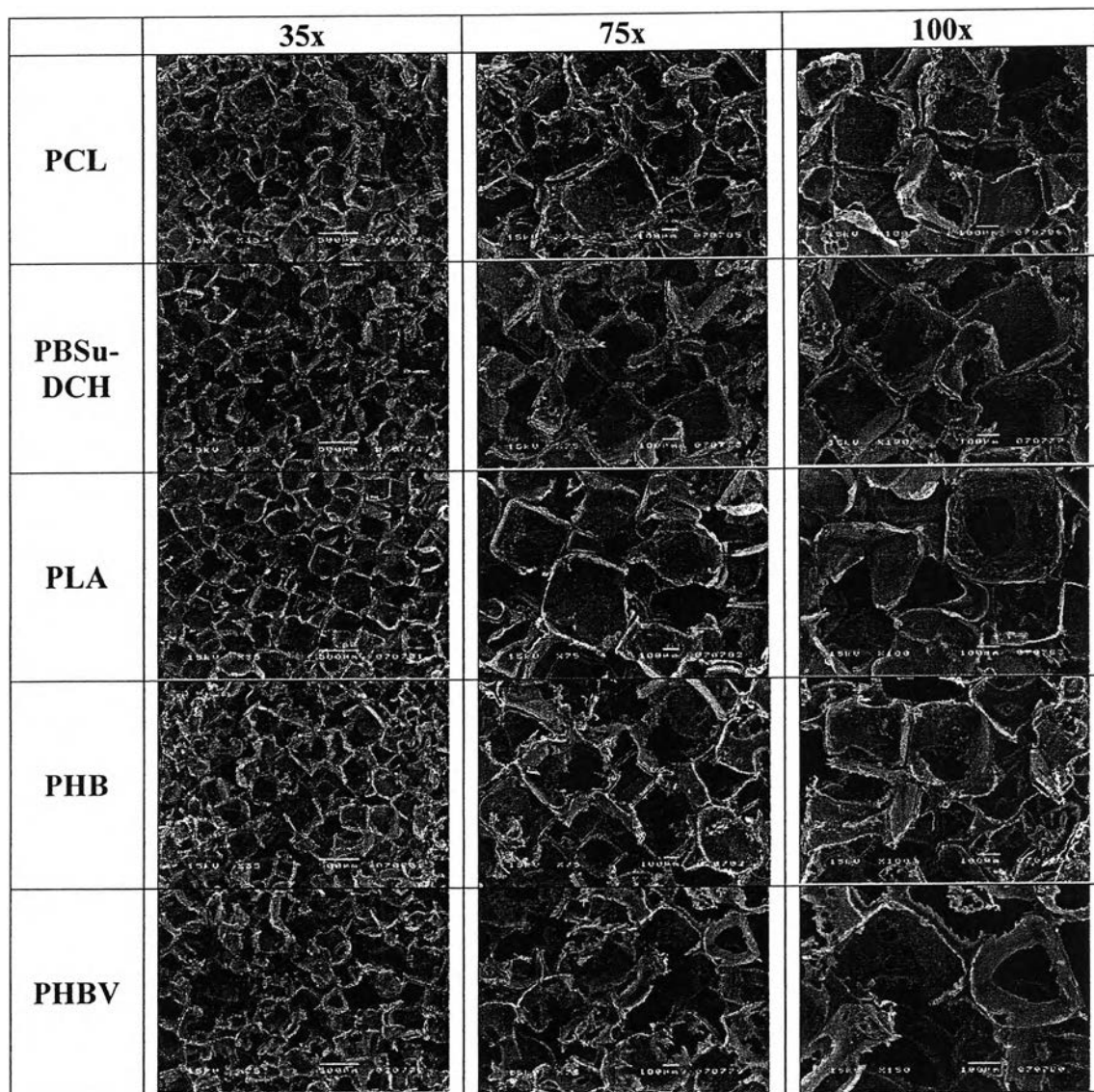
Table B4 Compressive modulus of degraded scaffolds in lipase/PBS solution

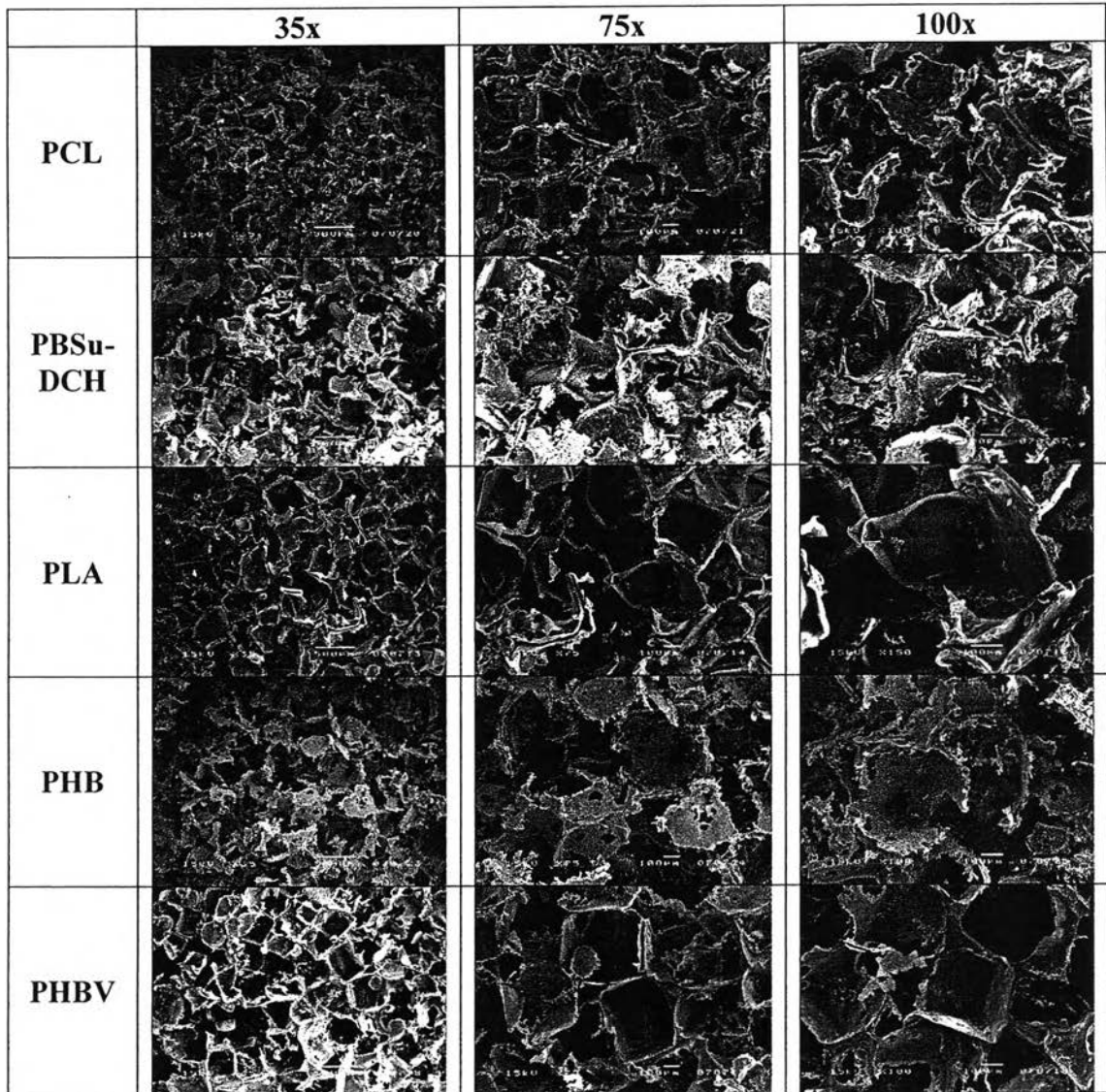
| Time (week) | Compressive Modulus (KPa) | | | | | | | | | |
|-------------|---------------------------|------|----------|------|---------|-------|---------|-------|---------|-------|
| | PCL | | PBSu-DCH | | PLA | | PHB | | PHBV | |
| | average | SD | average | SD | average | SD | average | SD | average | SD |
| 0 | 39.90 | 5.55 | 67.43 | 8.90 | 164.94 | 10.89 | 98.83 | 14.76 | 109.38 | 11.42 |
| 1 | Nd | Nd | Nd | Nd | 160.68 | 17.95 | 93.10 | 16.42 | 90.57 | 5.30 |
| 3 | 28.15 | 7.18 | 34.18 | 4.07 | 120.15 | 14.95 | 89.26 | 13.47 | 89.00 | 5.98 |
| 5 | 23.58 | 4.29 | 22.33 | 5.37 | 118.72 | 15.19 | 85.48 | 16.95 | 88.94 | 12.41 |
| 7 | 20.19 | 5.29 | * | * | 114.02 | 21.33 | 66.70 | 26.42 | 87.16 | 10.20 |
| 9 | 17.63 | 5.90 | * | * | 104.44 | 9.44 | 61.65 | 12.22 | 75.02 | 10.09 |
| 11 | 16.15 | 3.07 | * | * | 104.29 | 14.57 | 59.16 | 6.52 | 63.11 | 7.16 |
| 13 | * | * | * | * | 103.58 | 15.30 | 55.14 | 6.22 | 56.34 | 11.95 |

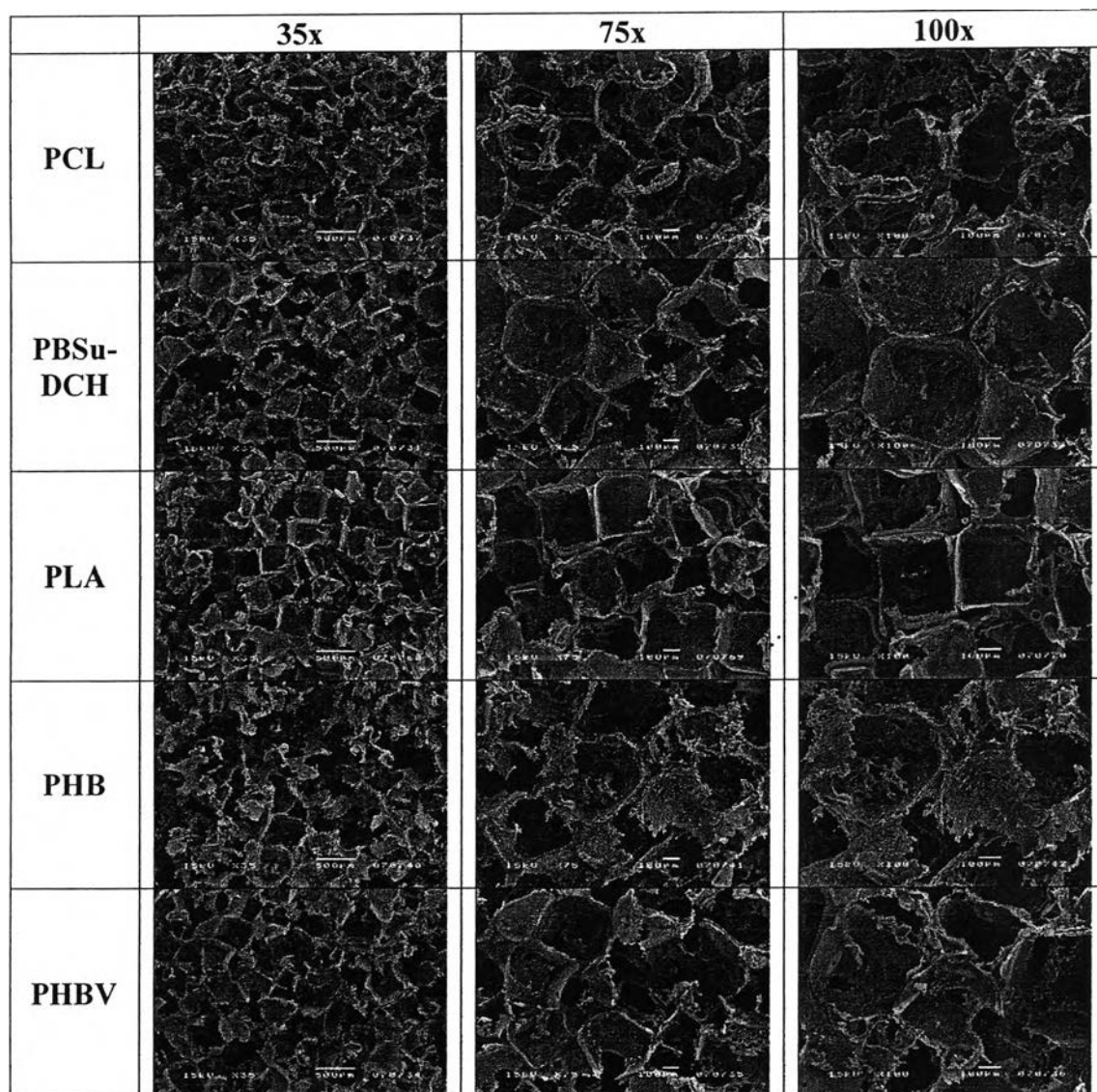
Nd : not determined

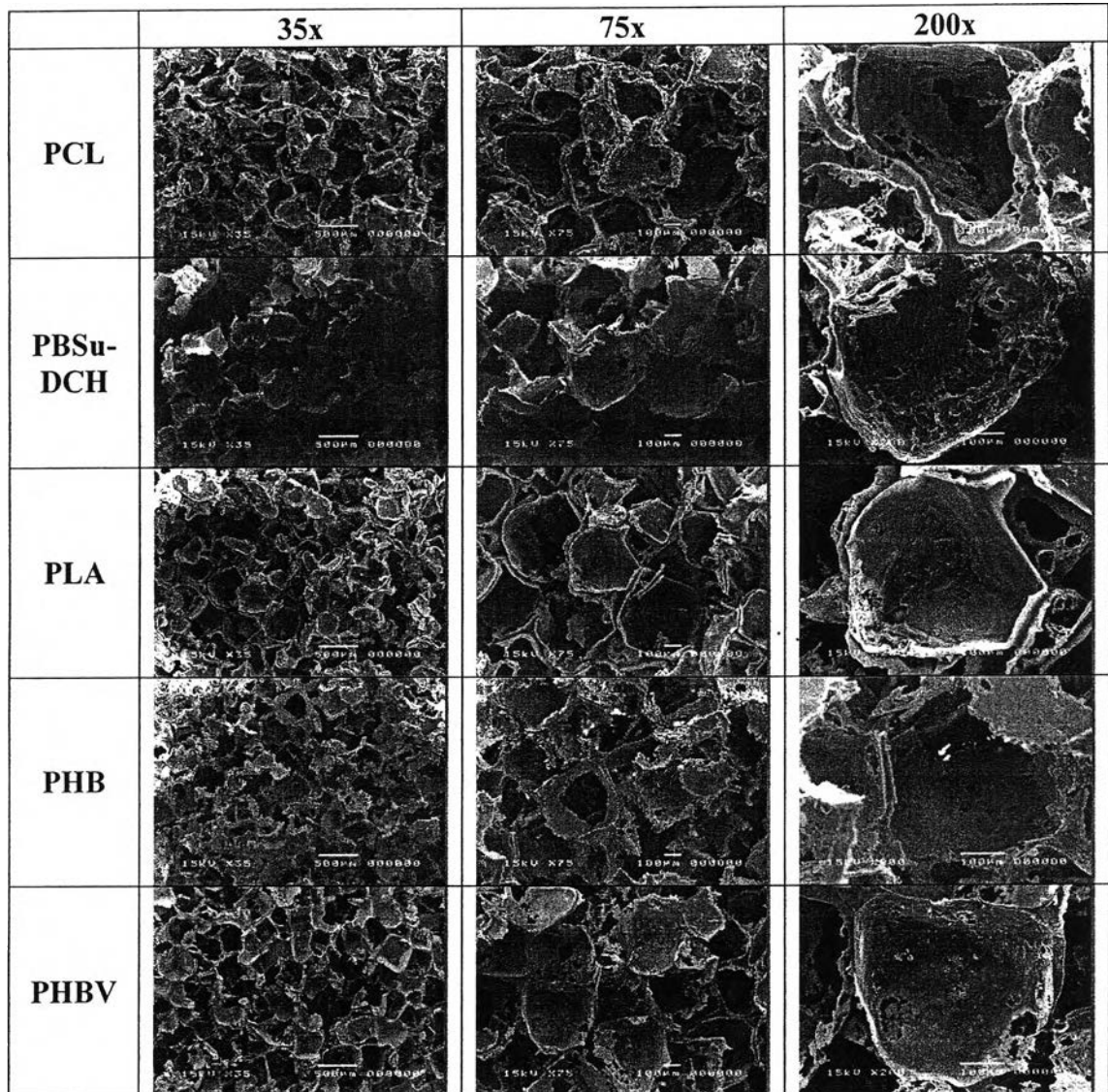
The asterisk means that it can't be determined because it loss of cylindrical shape.

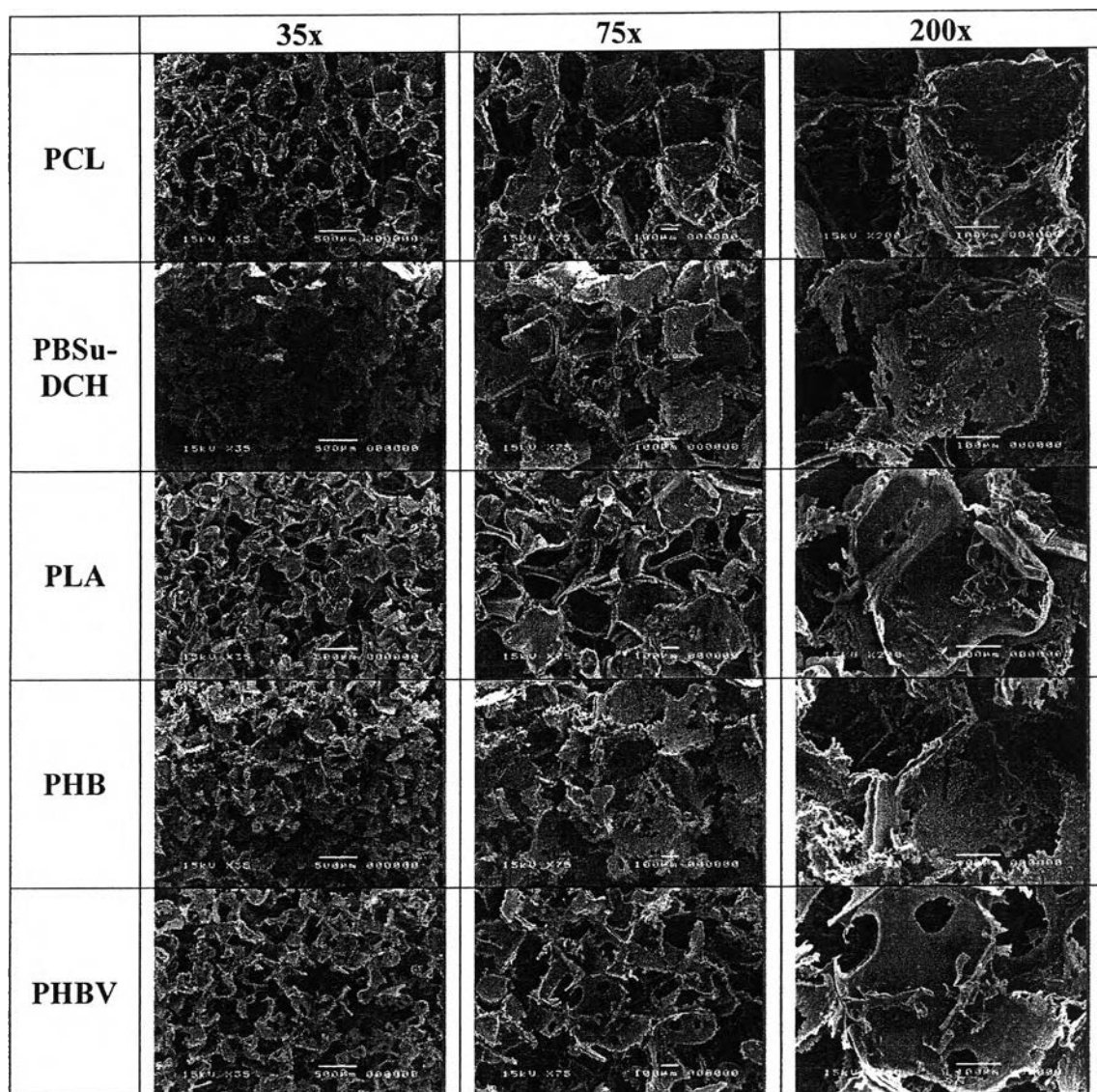
Table B7 The morphology of degraded scaffolds in PBS solution at different time
Week 0

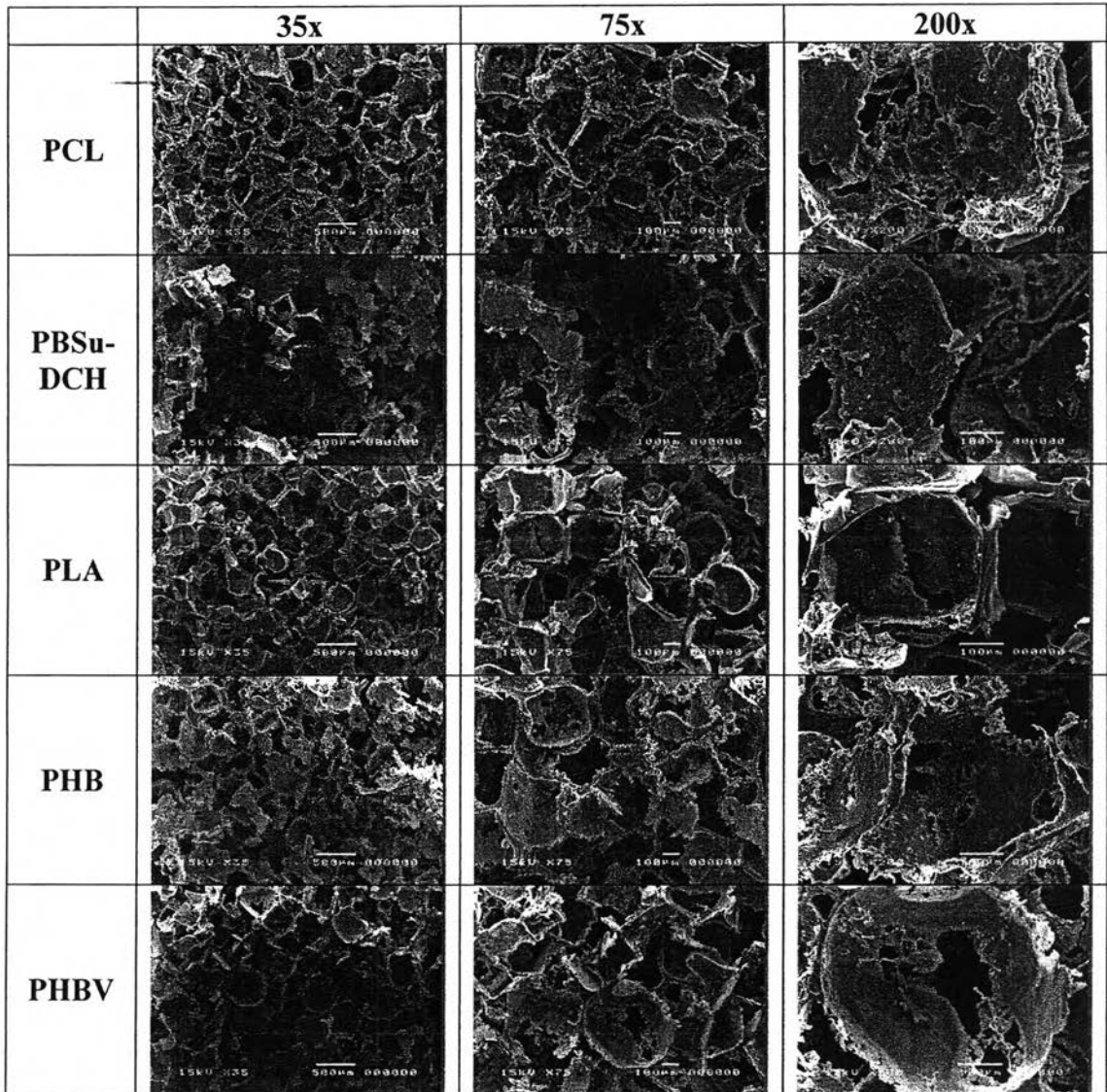


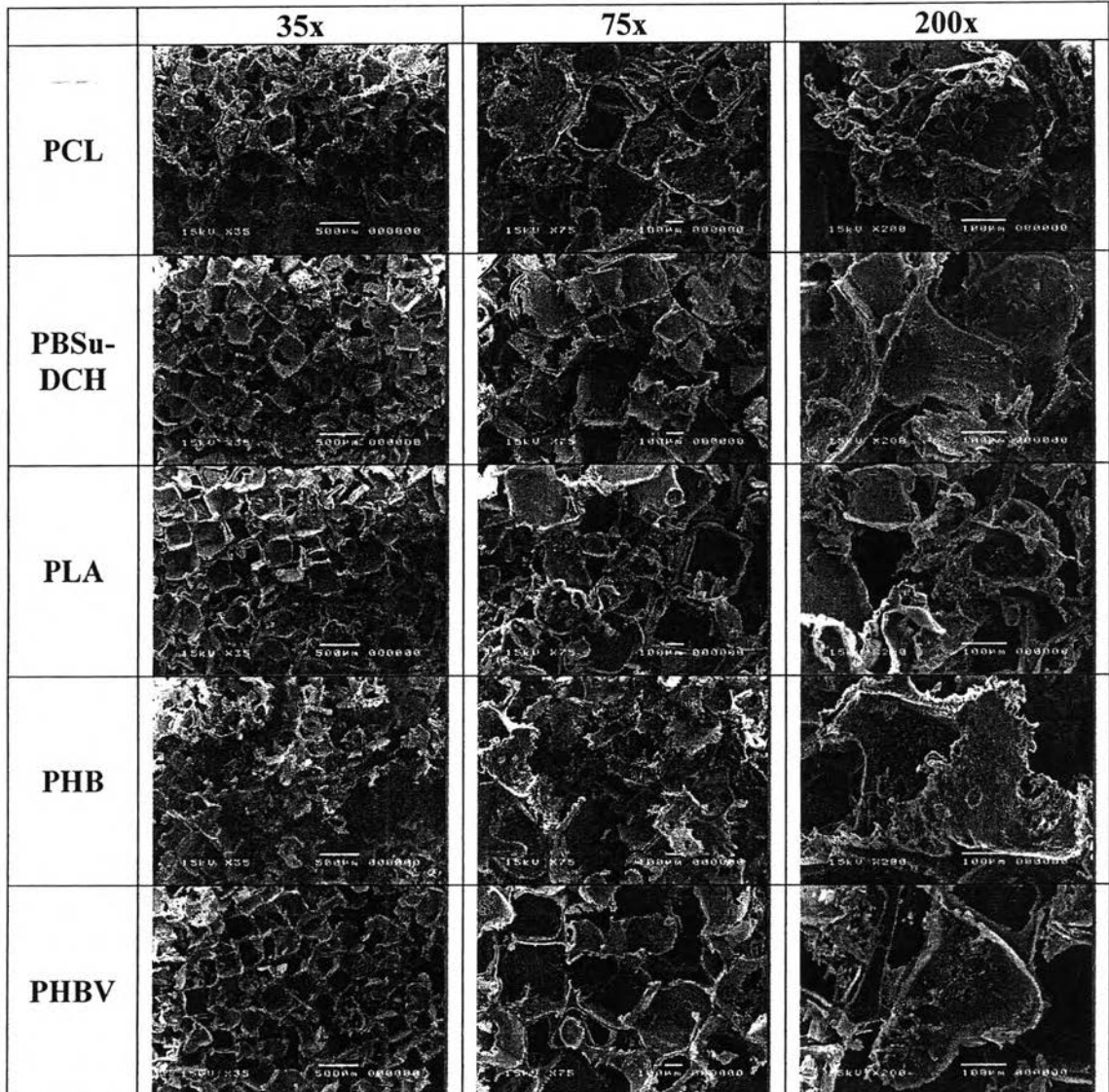
Week 1

Week 3

Week 5

Week 7

Week 9

Week 11

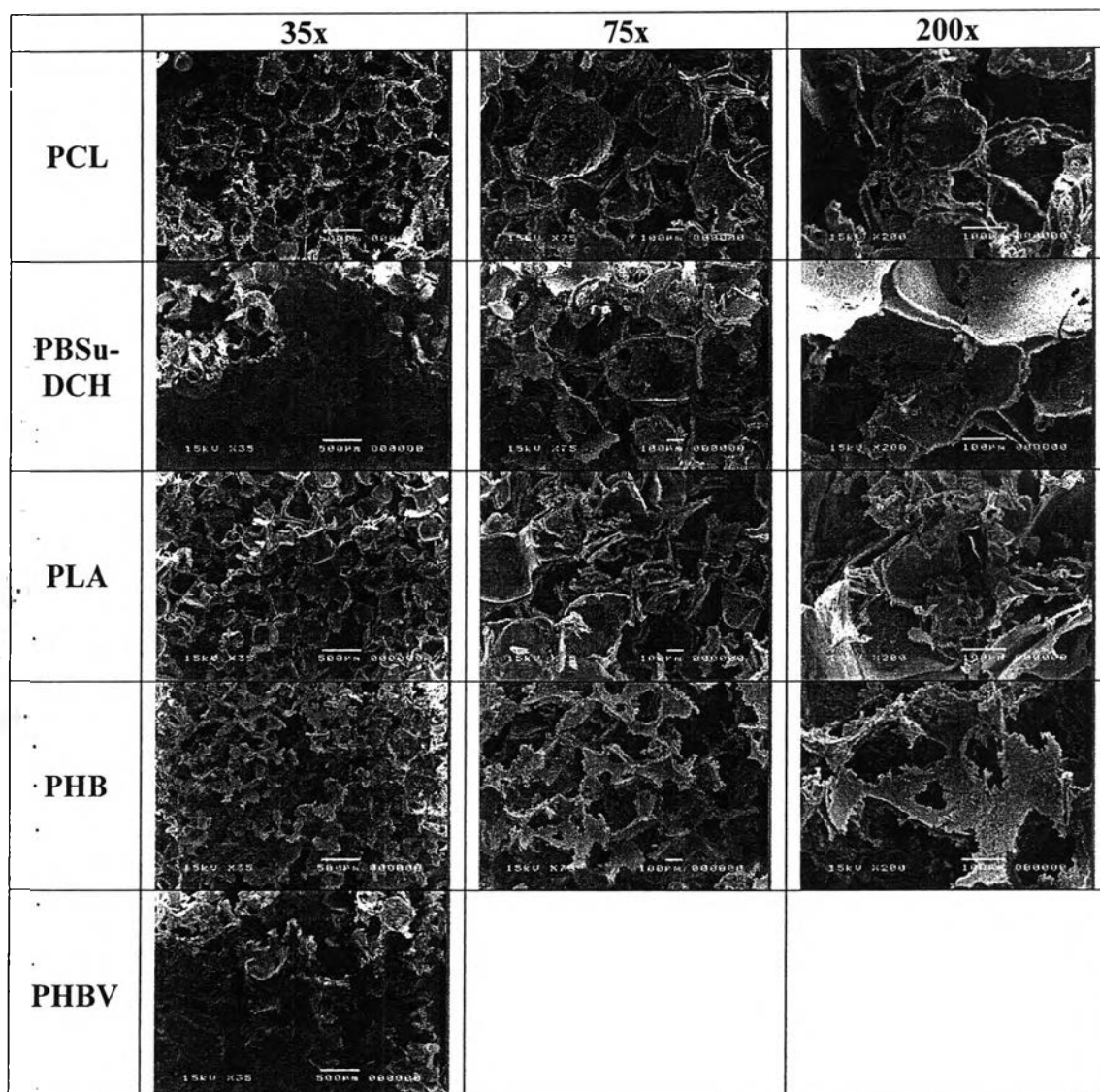
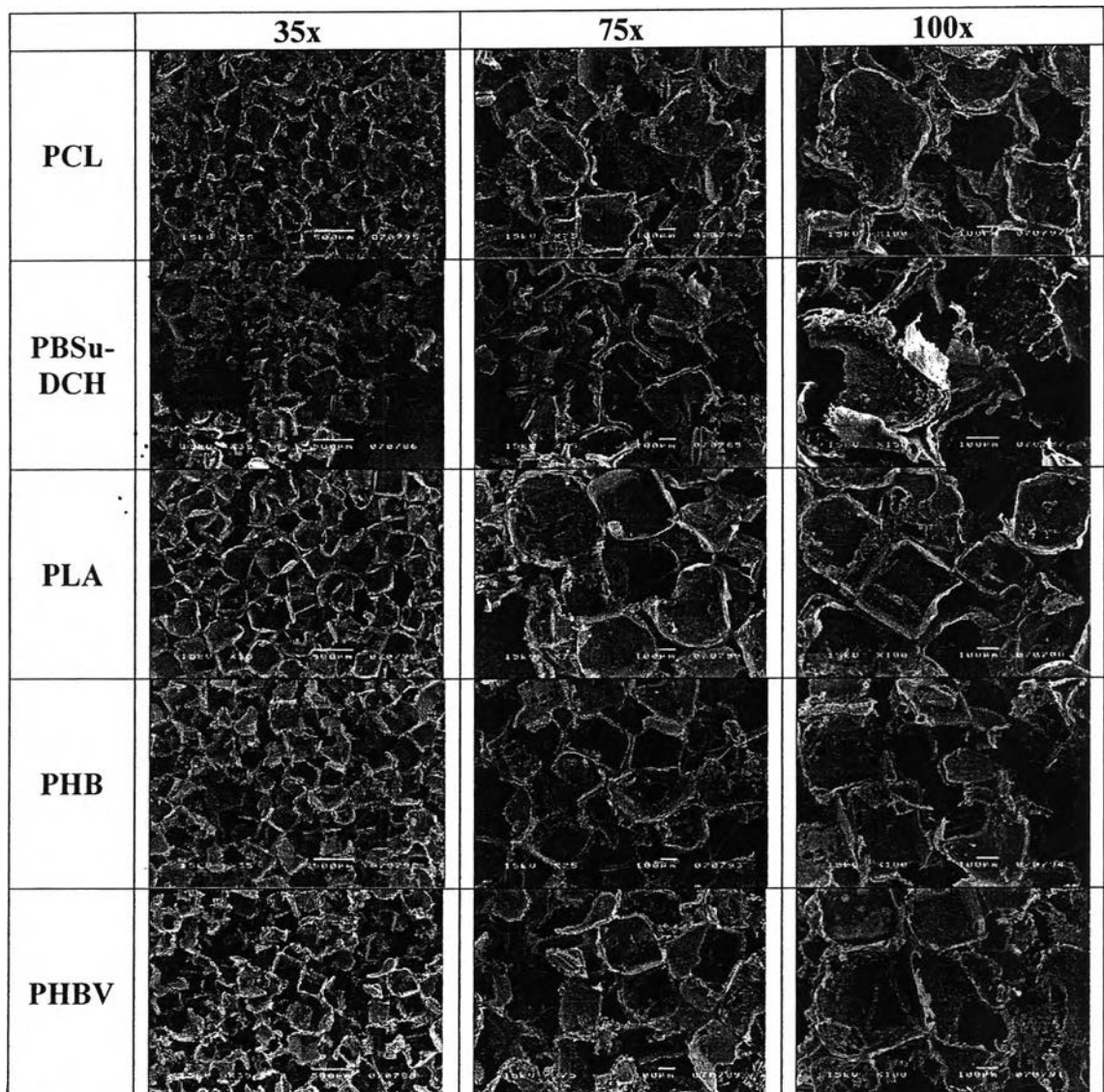
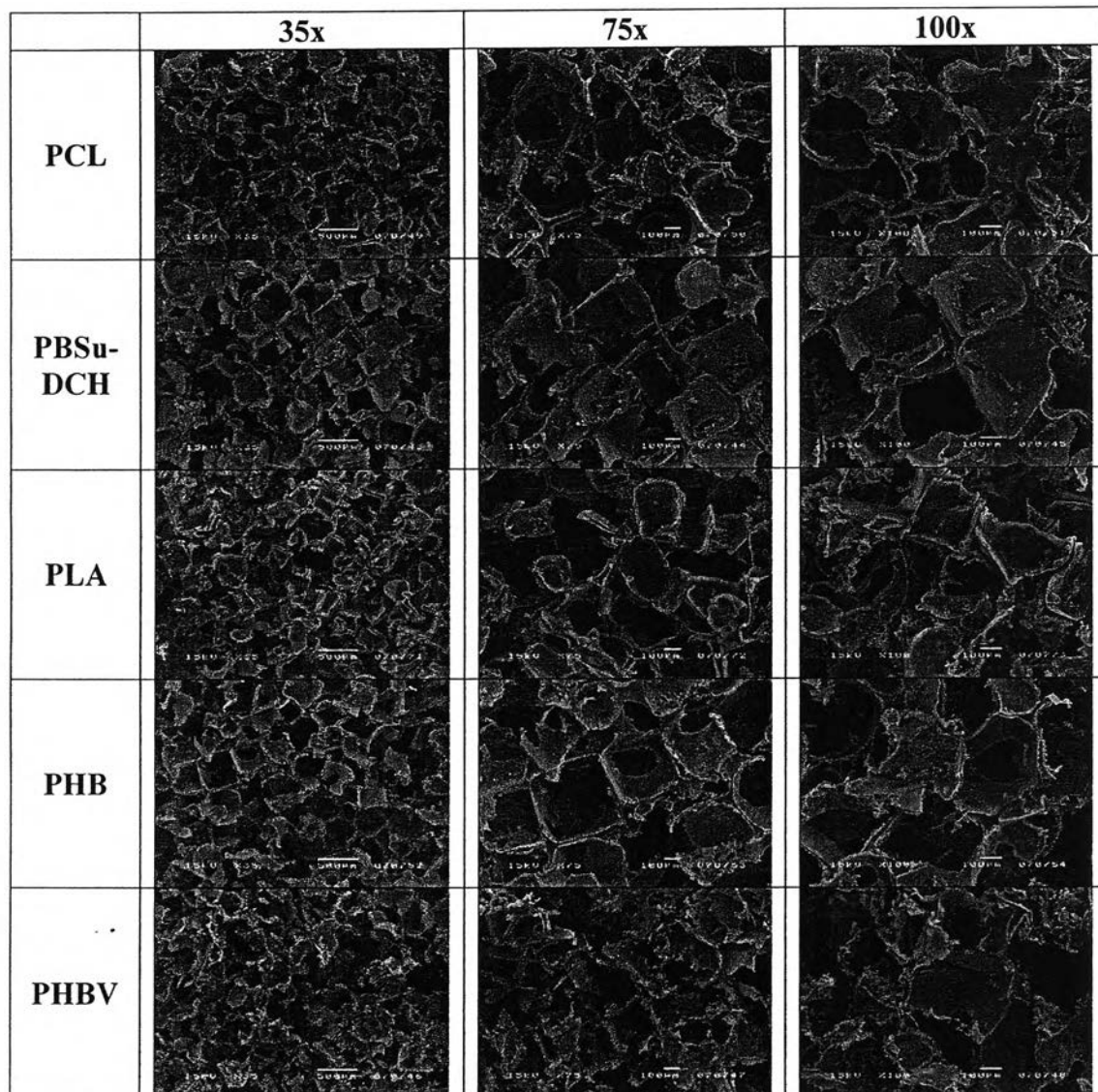
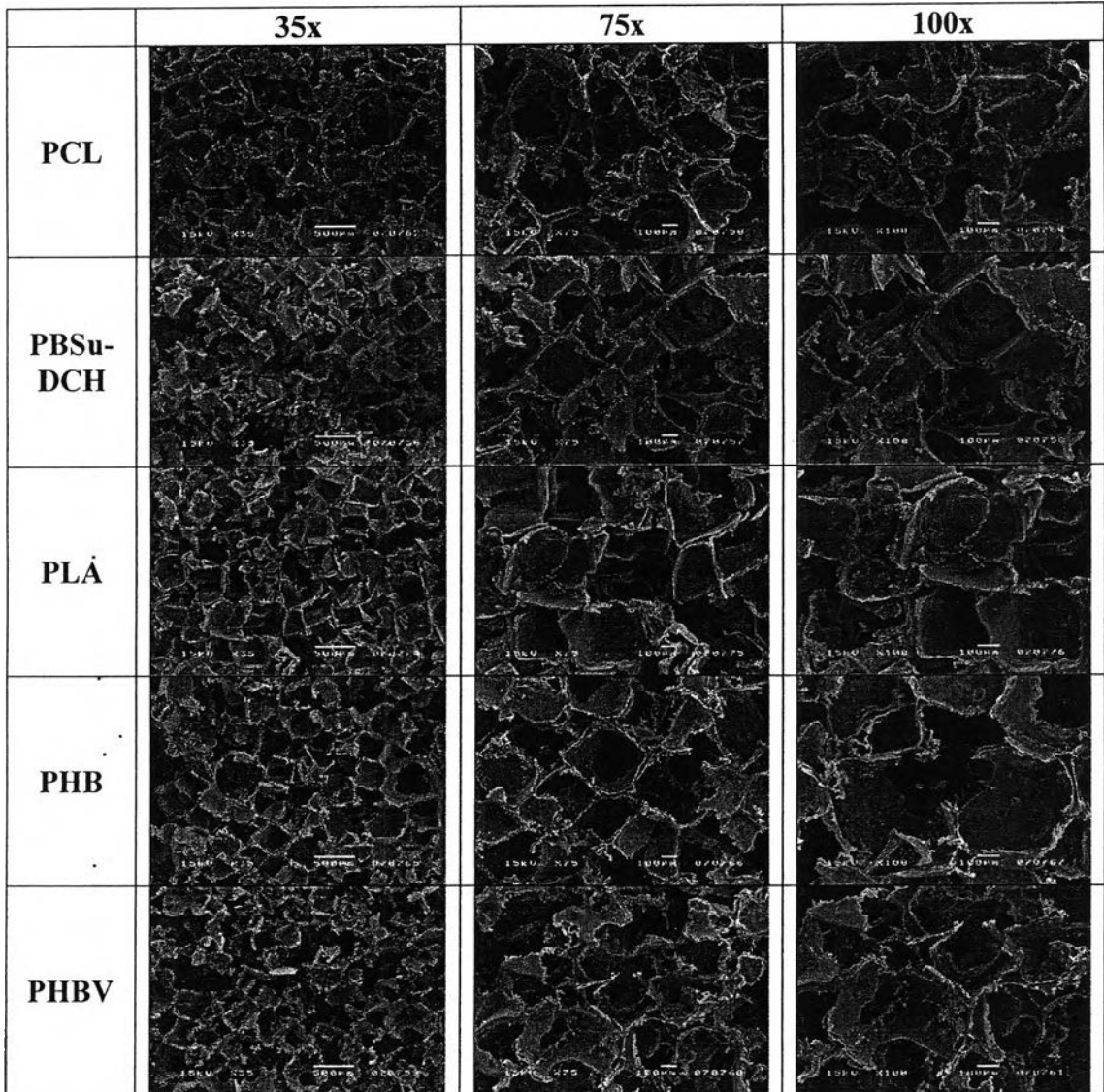
Week 13

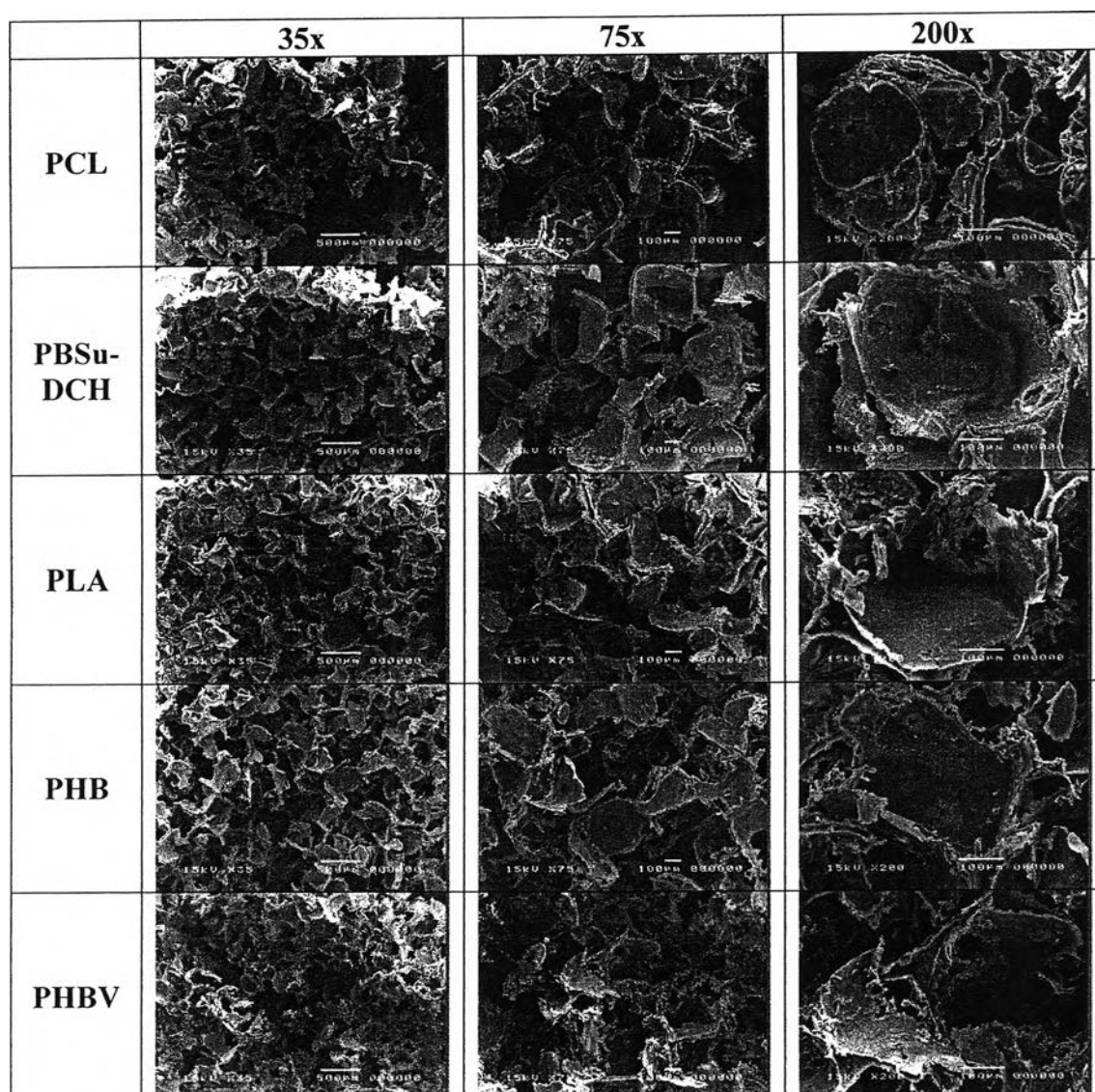
Table B8 The morphology of degraded scaffolds in lipase/PBS solution at different time

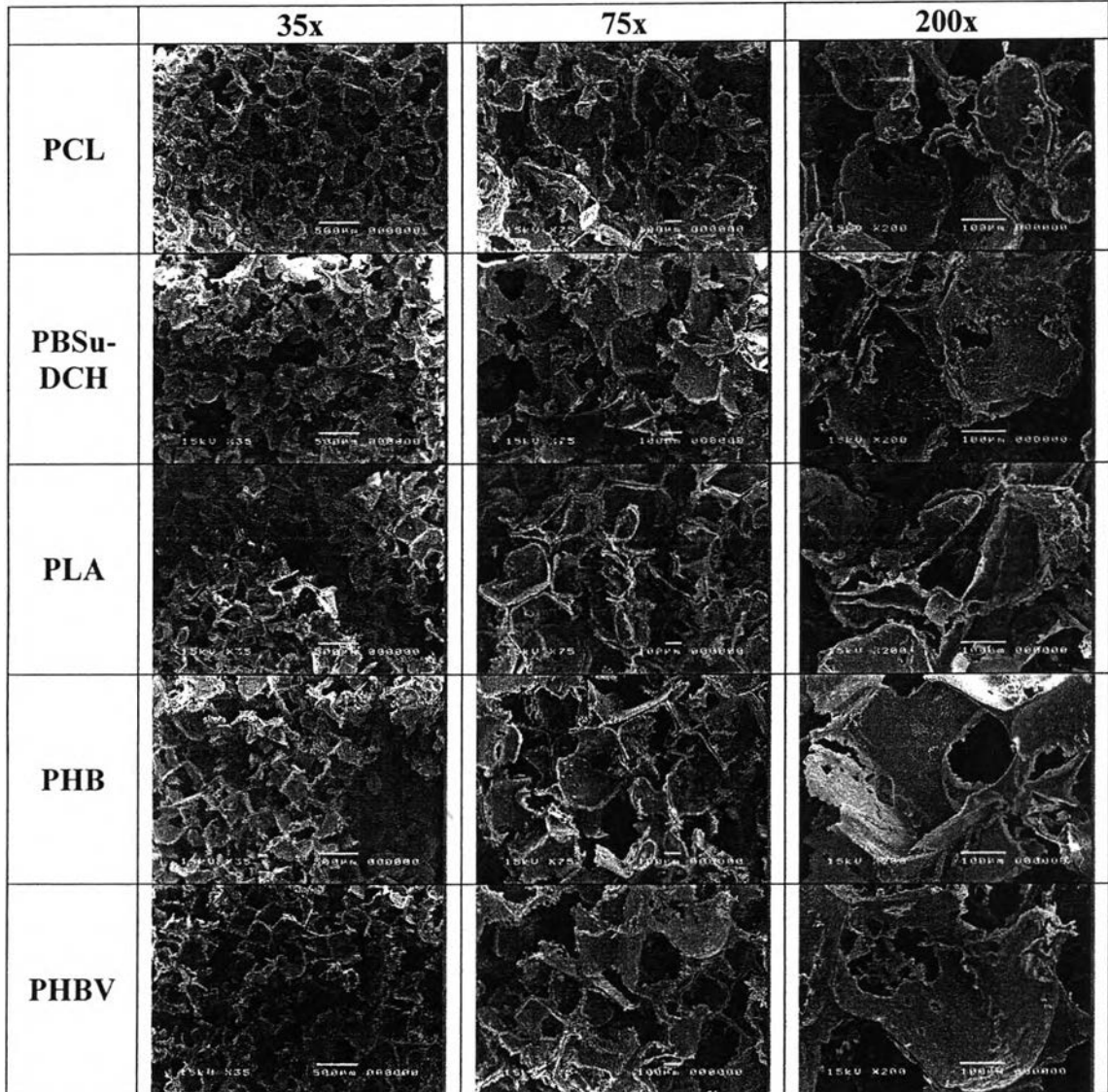
Week 1

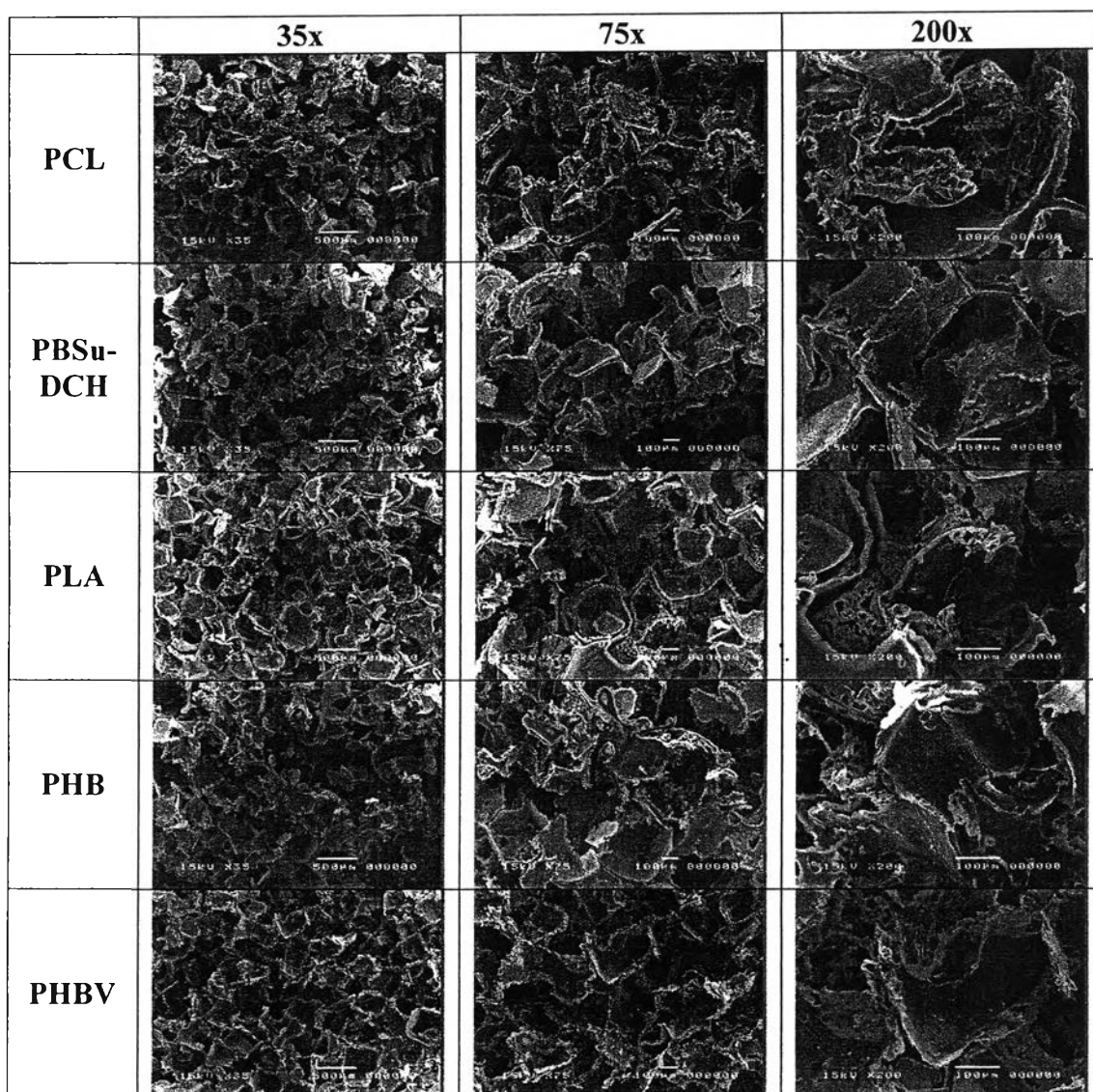


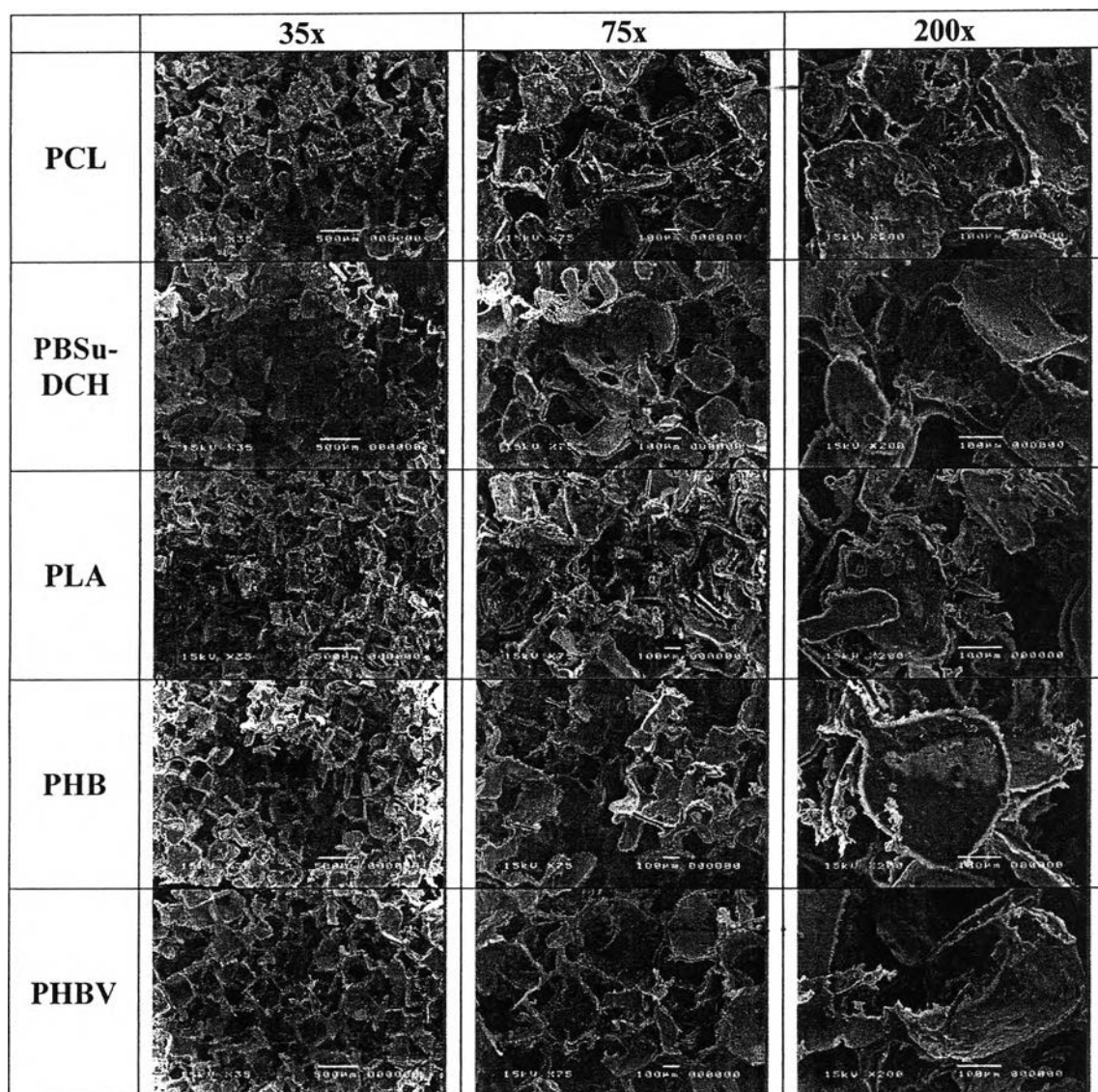
Week 3

Week 5

Week 7

Week 9

Week 11

Week 13

Appendix C Cell Culture

The 5 types of porous scaffolds were evaluated in vitro with human osteoblasts (SaOS-2). To ensure the scaffolds were safe for cells, the cytotoxicity of the scaffolds was tested compared by TCPS. The result was shown in Table C1.

Table C1 Raw data of cytotoxic test of porous scaffolds which evaluated from the absorbance at 570 nm by MTT method

| Material | Absorbance at 570 nm | | | Average | SD |
|----------------|----------------------|-------|-------|---------|-------|
| | 1 | 2 | 3 | | |
| TCPS (control) | 0.344 | 0.334 | 0.330 | 0.336 | 0.007 |
| PCL | 0.354 | 0.354 | 0.346 | 0.351 | 0.005 |
| PBSu-DCH | 0.347 | 0.341 | 0.342 | 0.343 | 0.003 |
| PLA | 0.292 | 0.286 | 0.297 | 0.292 | 0.006 |
| PHB | 0.304 | 0.289 | 0.298 | 0.297 | 0.008 |
| PHBV | 0.283 | 0.290 | 0.286 | 0.286 | 0.004 |

Table C2 Raw data of ALP activity of porous scaffolds which evaluated from the ALP assay divided by total protein assay

| | Porous Scaffolds | | | | | | | | | | | | | | |
|---------------|------------------|--------|--------|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | PCL | | | PBSu-DCH | | | PLA | | | PHB | | | PBHV | | |
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| ALP assay | 147.08 | 136.72 | 132.02 | 300.77 | 298.80 | 288.70 | 357.22 | 241.37 | 419.57 | 170.69 | 181.97 | 177.87 | 315.45 | 309.41 | 329.60 |
| Protein assay | 10.50 | 9.82 | 8.33 | 20.04 | 18.77 | 15.73 | 34.81 | 27.33 | 38.38 | 35.88 | 40.36 | 41.80 | 26.58 | 28.73 | 26.70 |
| ALP activity | 14.01 | 13.92 | 15.85 | 15.01 | 15.92 | 18.35 | 10.26 | 8.83 | 10.93 | 4.76 | 4.51 | 4.26 | 11.87 | 12.86 | 12.35 |
| Average | 14.59 | | | 16.43 | | | 10.01 | | | 4.51 | | | 12.36 | | |
| SD | 1.09 | | | 1.73 | | | 1.07 | | | 0.25 | | | 0.50 | | |

Table C3 Raw data of cell attachment and proliferation of porous scaffolds which evaluated from the absorbance at 570 nm by MTT method

| Time | | Absorbance at 570 nm | | | | | |
|-------|---------|----------------------|-------|----------|-------|-------|-------|
| | | TCPS (control) | PCL | PBSu-DCH | PLA | PHB | PHBV |
| 1 hr | 1 | 0.066 | 0.139 | 0.228 | 0.093 | 0.115 | 0.130 |
| | 2 | 0.060 | 0.178 | 0.231 | 0.108 | 0.107 | 0.108 |
| | 3 | 0.064 | 0.166 | 0.230 | 0.120 | 0.089 | 0.106 |
| | Average | 0.063 | 0.161 | 0.230 | 0.107 | 0.104 | 0.115 |
| | SD | 0.003 | 0.020 | 0.002 | 0.014 | 0.013 | 0.013 |
| 4 hr | 1 | 0.072 | 0.160 | 0.241 | 0.143 | 0.125 | 0.133 |
| | 2 | 0.077 | 0.158 | 0.269 | 0.143 | 0.150 | 0.147 |
| | 3 | 0.086 | 0.169 | 0.270 | 0.137 | 0.136 | 0.147 |
| | Average | 0.078 | 0.162 | 0.260 | 0.141 | 0.137 | 0.142 |
| | SD | 0.007 | 0.006 | 0.016 | 0.003 | 0.013 | 0.008 |
| 22 hr | 1 | 0.199 | 0.300 | 0.413 | 0.159 | 0.171 | 0.199 |
| | 2 | 0.198 | 0.304 | 0.485 | 0.151 | 0.168 | 0.198 |
| | 3 | 0.200 | 0.288 | 0.373 | 0.161 | 0.173 | 0.193 |
| | Average | 0.199 | 0.297 | 0.424 | 0.157 | 0.171 | 0.197 |
| | SD | 0.001 | 0.008 | 0.057 | 0.005 | 0.003 | 0.003 |
| 24 hr | 1 | 0.211 | 0.380 | 0.463 | 0.213 | 0.192 | 0.212 |
| | 2 | 0.208 | 0.371 | 0.479 | 0.185 | 0.196 | 0.205 |
| | 3 | 0.212 | 0.407 | 0.501 | 0.207 | 0.208 | 0.220 |
| | Average | 0.210 | 0.386 | 0.481 | 0.202 | 0.199 | 0.212 |
| | SD | 0.002 | 0.019 | 0.019 | 0.015 | 0.008 | 0.008 |
| 48 hr | 1 | 0.516 | 0.509 | 0.557 | 0.282 | 0.382 | 0.363 |
| | 2 | 0.514 | 0.480 | 0.644 | 0.324 | 0.352 | 0.421 |
| | 3 | 0.513 | 0.549 | 0.613 | 0.260 | 0.364 | 0.412 |
| | Average | 0.514 | 0.513 | 0.605 | 0.289 | 0.366 | 0.399 |
| | SD | 0.002 | 0.035 | 0.044 | 0.033 | 0.015 | 0.031 |
| 72 hr | 1 | 0.680 | 0.495 | 0.644 | 0.324 | 0.385 | 0.429 |
| | 2 | 0.690 | 0.567 | 0.708 | 0.416 | 0.346 | 0.339 |
| | 3 | 0.687 | 0.625 | 0.694 | 0.347 | 0.394 | 0.401 |
| | Average | 0.686 | 0.562 | 0.682 | 0.362 | 0.375 | 0.390 |
| | SD | 0.005 | 0.065 | 0.034 | 0.048 | 0.026 | 0.046 |

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Proceedings:

1. Prasansuklarb, A., Pavasant, P., and Supaphol, P. (2008, April 23) Osteoblastic Cell Growth and Enzymatic Degradation of Different Aliphatic Polyester Scaffolds. Proceedings of the 14th PPC Symposium on Petroleum, Petrochemicals, and Polymers 2008. Bangkok, Thailand.

Presentations:

1. Prasansuklarb, A., Pavasant, P., and Supaphol, P. (2008, April 23) Osteoblastic Cell Growth and Enzymatic Degradation of Different Aliphatic Polyester Scaffolds. Poster presented at the 14th PPC Symposium on Petroleum, Petrochemicals, and Polymers 2008. Bangkok, Thailand.

