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# Synthesis, Characterization and Thermal Properties of Poly(ethylene oxide), PEO, Polymacromonomers via Anionic and Ring Opening Metathesis Polymerization

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# Supporting Information

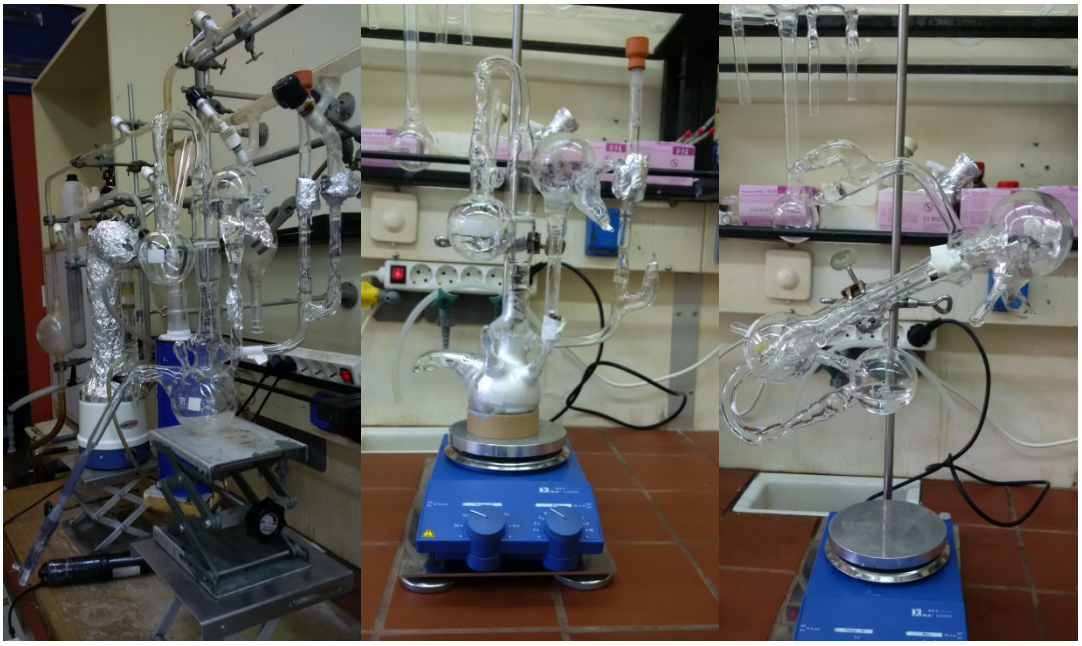


**Figure S1:** Apparatus used for the preparation of the norbornene oxyanion in various phases of the process

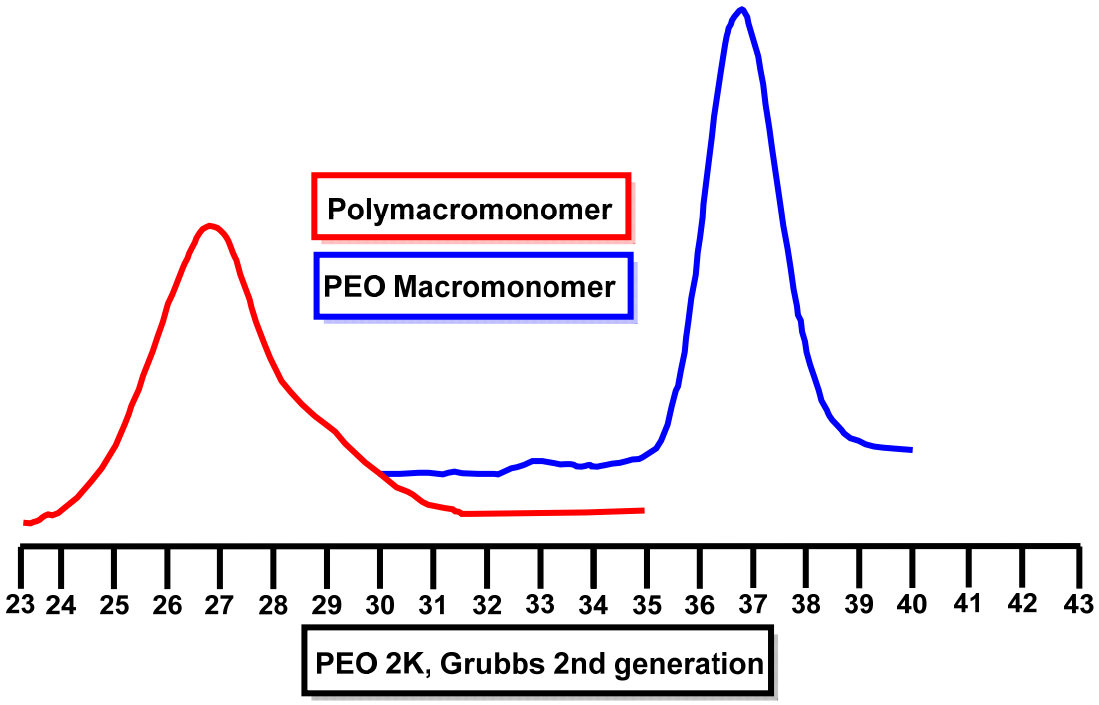



**Figure S2:** SEC traces of PEO 2k and polymacromonomer employing Grubbs 2nd generation as the catalyst

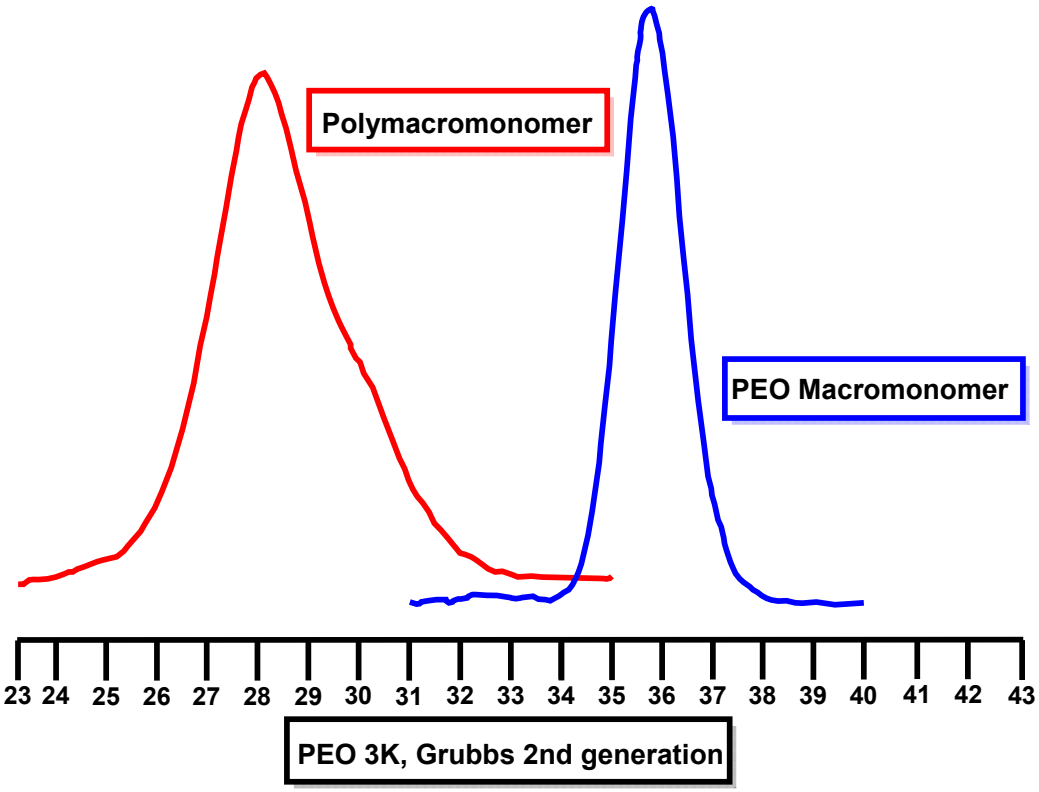



**Figure S3:** SEC traces of PEO 3k and polymacromonomer employing Grubbs 2nd generation as the catalyst

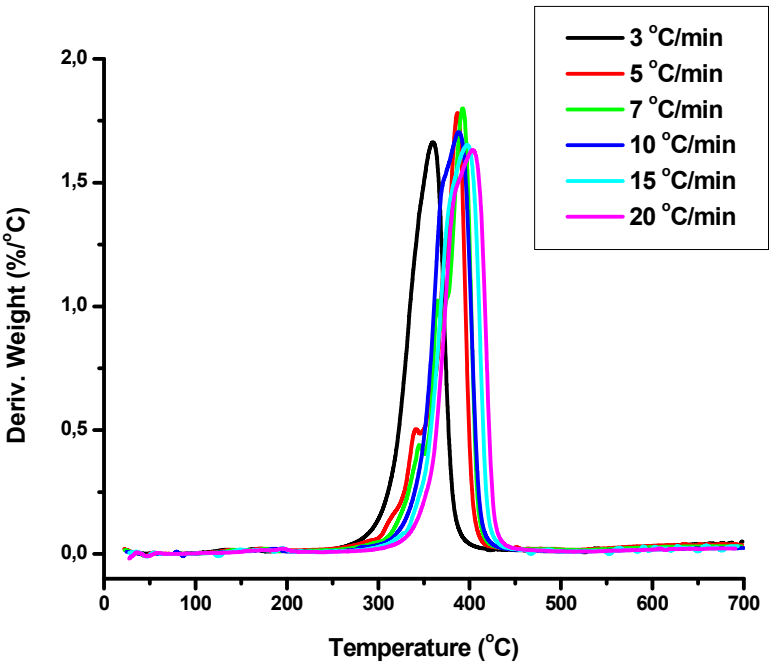
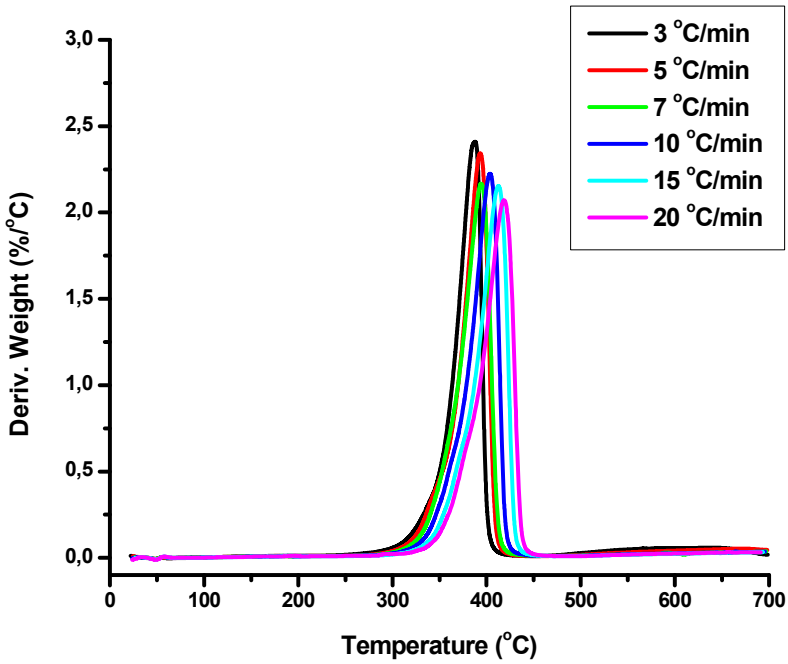



**Figure S4:** Derivative weight loss with temperature for 2-45-3-THF under different heating rates

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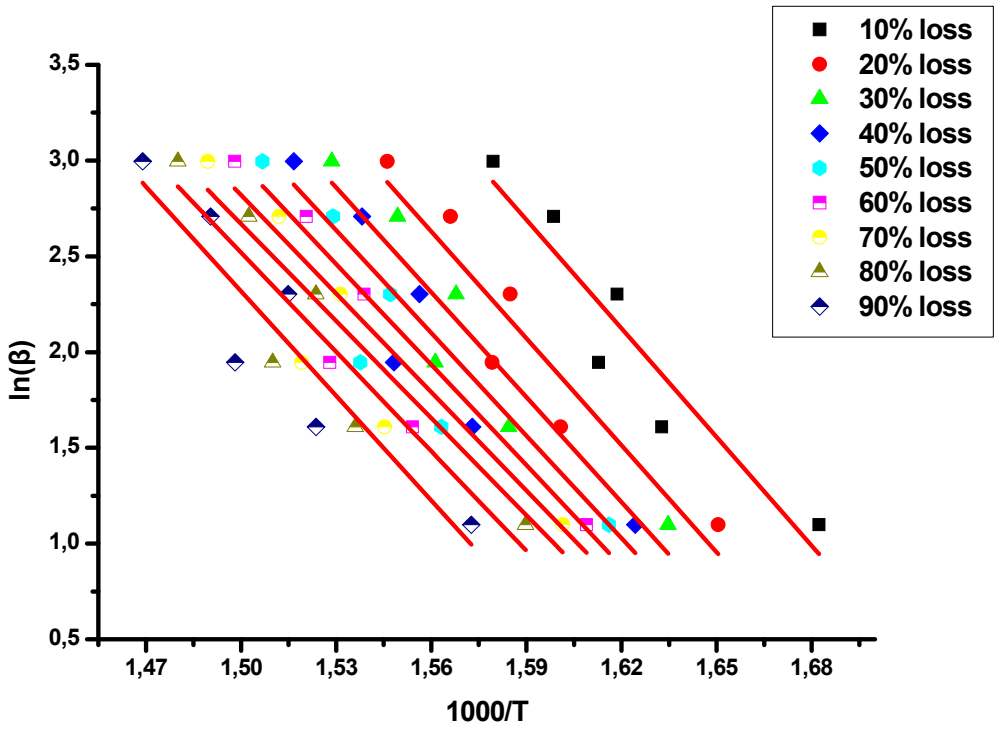
64 **Figure S5:** Derivative weight loss with temperature for 3-50-3-THF under different heating rates

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66 **Figure S6:** OFW plots for PEO 3K

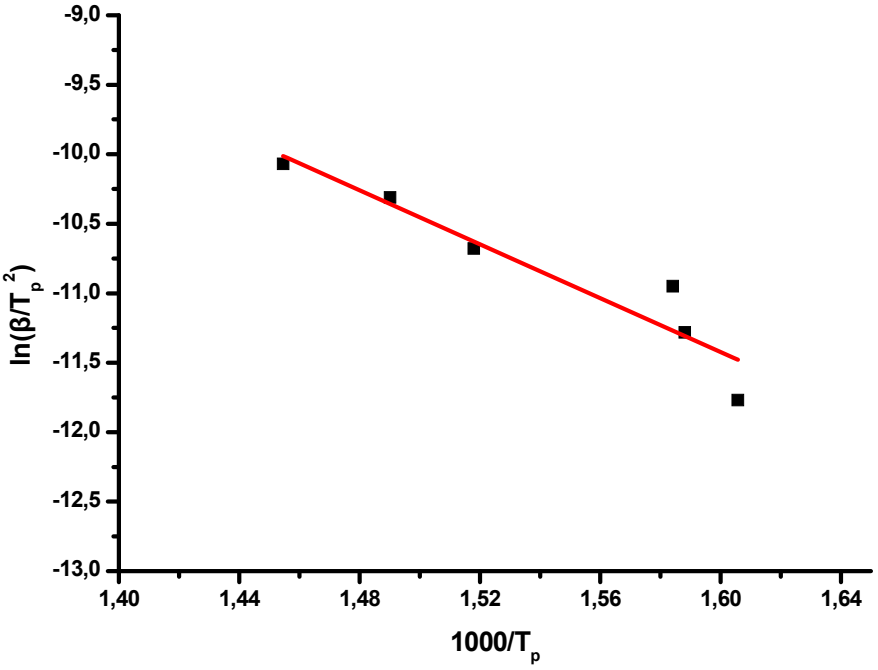


**Figure S7:** Kissinger plot for 1-205-3-THF

**Table S1:** Molecular characteristics of polymacromonomers synthesized with conventional addition method

| PEO macro/mer | Grubbs catalyst | Solvent | Mw (SEC) | Mw/Mn | yield (%) |
|---|---|---|---|---|---|
| 1k | 2nd | TOL | 85,000 | 1.29 | 100 |
| 1k | 2nd | TOL | 50,000 | 1.09 | 100 |
| 1k | 2nd | TOL | 10,000 | 1.09 | 100 |
| 2k | 2nd | TOL | 128,000 | 1.50 | 100 |
| 2k | 2nd | TOL | 80,000 | 1.30 | 100 |
| 3k | 2nd | TOL | 70,000 | 1.32 | 100 |
| 3k | 2nd | TOL | 90,000 | 1.25 | 100 |
| 5k | 2nd | TOL | 95,000 | 1.45 | 98 |
| 5k | 2nd | DCBz | 100,000 | Bimodal1.37 | 93 |
| 5k | 2nd | DCBz | 120,000 | Bimodal1.30 | 98 |
| 5k | 2nd | DCBz | 160,000 | 1.63 | 100 |

| | | | | | |
|---|---|---|---|---|---|
| 5k | 2nd | $CH_2Cl_2$ | 75,000 | Bimodal1.80 | 35 |
| 5k | 2nd | $EtOH/CH_2Cl_2$ | 40,000 | 1.16 | 10 |
| 5k | 2nd | $EtOH/CH_2Cl_2$ | 245,000 | 1.28 | 70 |

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73 **Table S2:** TGA results for sample 2-45-3-THF

| Heating Rate (°C/min) | Start (°C) | Finish (°C) | $T_p$ (°C) | Residue % (700 °C) |
|---|---|---|---|---|
| **3** | 269.43 | 404.93 | 360.18 | 12.7 |
| **5** | 295.53 | 419.23 | 386.29 | 17.4 |
| **7** | 298.64 | 427.93 | 392.50 | 16.8 |
| **10** | 297.26 | 434.37 | 387.48 | 10.7 |
| **15** | 316.05 | 439.74 | 397.47 | 10.1 |
| **20** | 313.56 | 445.34 | 403.07 | 9.5 |

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76 **Table S3:** TGA results for sample 3-50-3-THF

| Heating Rate (°C/min) | Start (°C) | Finish (°C) | $T_p$ (°C) | Residue % (700 °C) |
|---|---|---|---|---|
| **3** | 295.53 | 421.10 | 387.53 | 2.4 |
| **5** | 300.51 | 424.20 | 393.75 | 2.4 |
| **7** | 303.61 | 427.93 | 394.37 | 6.2 |
| **10** | 306.10 | 436.64 | 403.07 | 4.9 |
| **15** | 316.56 | 447.20 | 412.39 | 4.8 |
| **20** | 318.53 | 451.55 | 417.99 | 4.1 |

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78 **Table S4:** TGA results for sample PEO 2K

| Heating Rate (°C/min) | Start (°C) | Finish (°C) | $T_p$ (°C) | Residue % (700 °C) |
|---|---|---|---|---|
| **3** | 252.64 | 384.42 | 350.85 | 4.2 |
| **5** | 262.59 | 394.37 | 362.04 | 3.9 |
| **7** | 260.72 | 394.37 | 357.69 | 2.3 |
| **10** | 273.10 | 389.61 | 359.77 | 1.3 |
| **15** | 283.72 | 409.29 | 381.93 | 2.3 |
| **20** | 271.29 | 410.53 | 383.80 | 2.4 |

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80 **Table S5:** TGA results for sample PEO 3K

| Heating Rate (°C/min) | Start (°C) | Finish (°C) | $T_p$ (°C) | Residue % (700 °C) |
|---|---|---|---|---|
| **3** | 255.75 | 390.02 | 347.13 | 0.8 |
| **5** | 260.72 | 404.93 | 371.37 | 2.6 |
| **7** | 264.45 | 413.64 | 383.80 | 2.6 |
| **10** | 281.24 | 408.04 | 379.45 | 1.3 |
| **15** | 279.37 | 422.34 | 383.18 | 1.6 |
| **20** | 286.21 | 429.18 | 394.37 | 2.1 |

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