

Appendix 1 – Standard Foam

1.1 Isothermal TVA Study

1.1.1 Non-condensable Volatiles

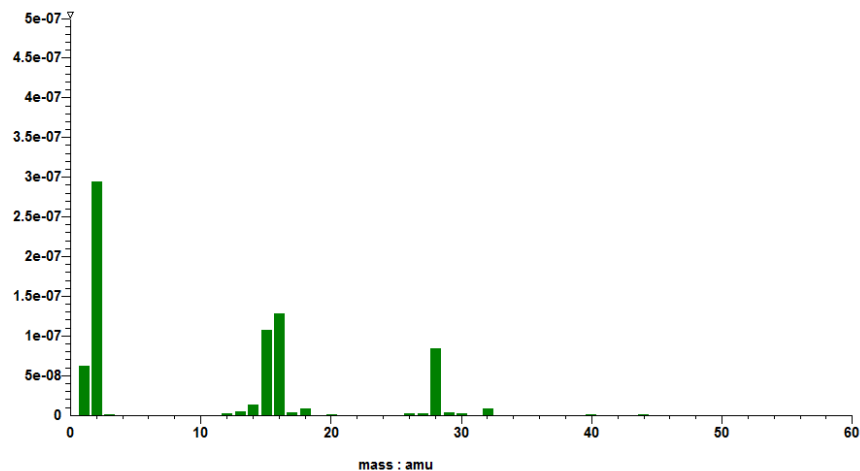


Figure 1.1: Mass spectrum of the non-condensable volatiles observed during the TVA at 350°C

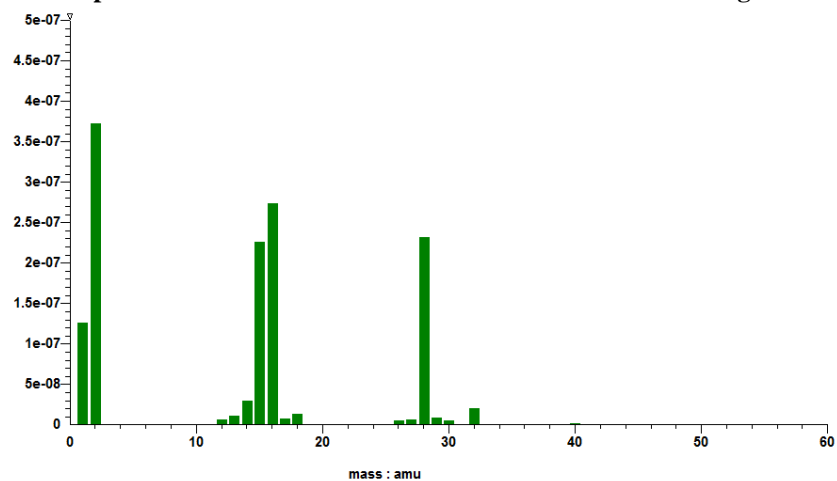


Figure 1.2: Mass spectrum of the non-condensable volatiles observed during the TVA at 400°C

1.1.2 Cold-ring Fractions

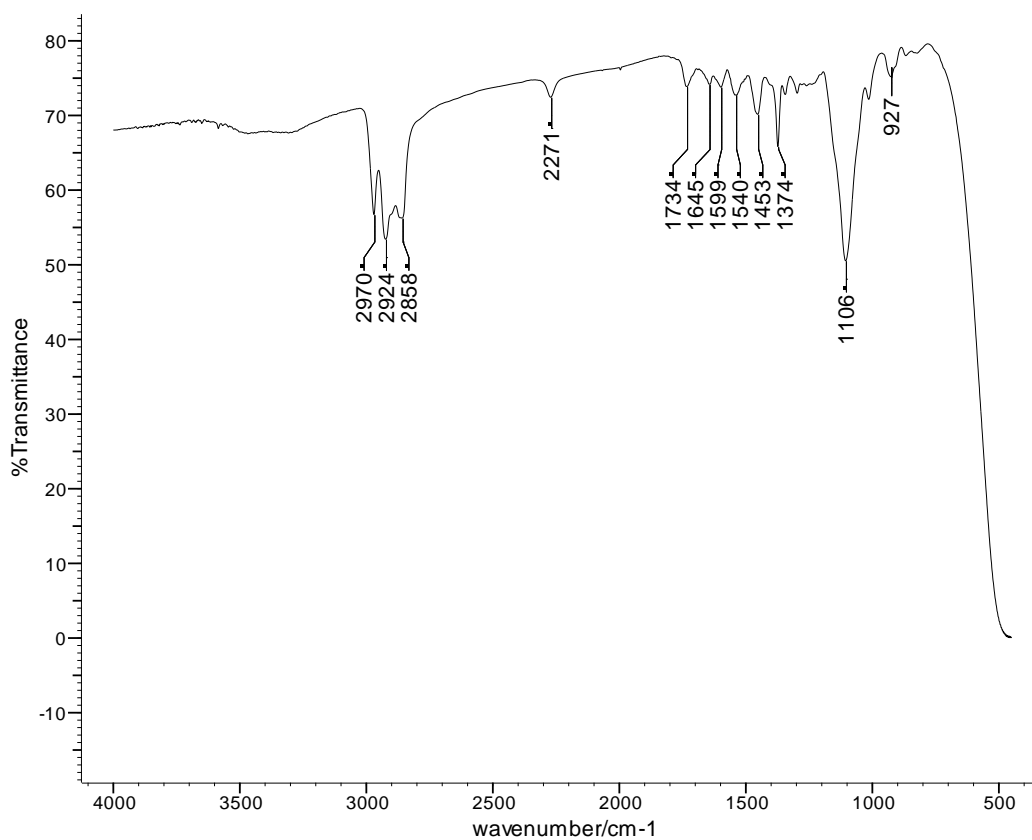


Figure 1.3: FTIR spectrum of the cold-ring fraction collected at 300°C

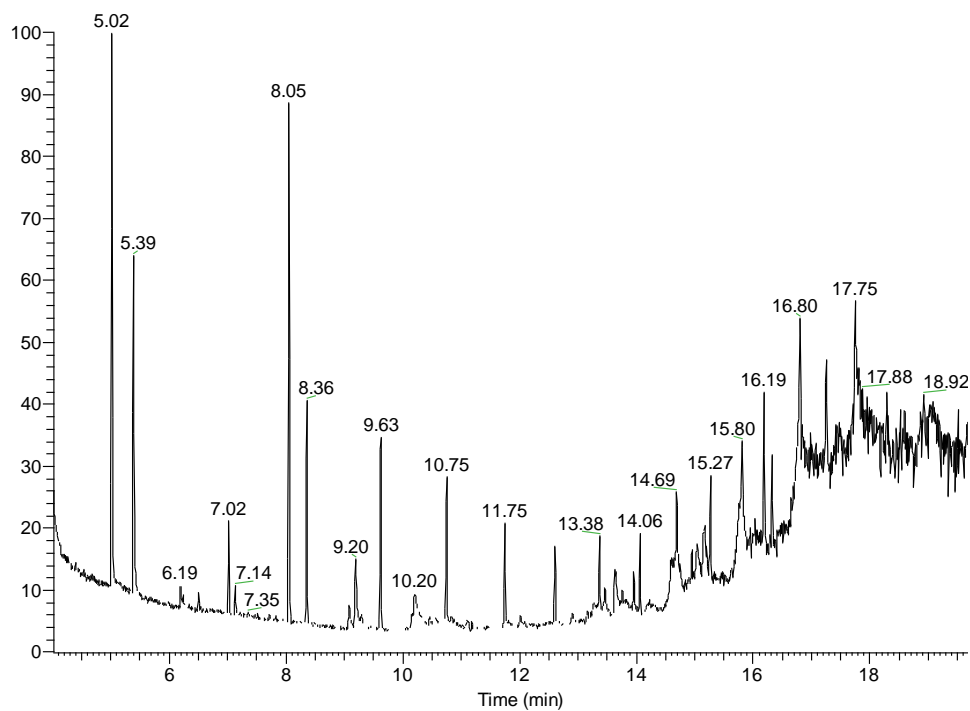


Figure 2: GC-MS chromatogram of the cold-ring fraction collected at 300°C

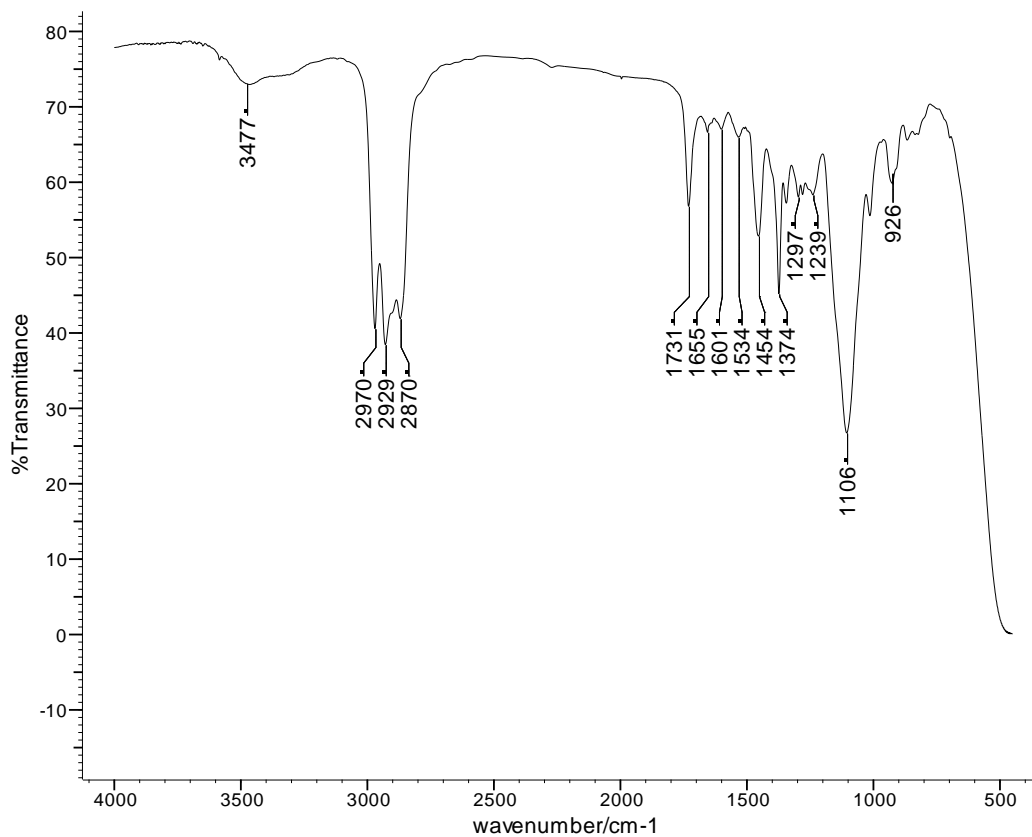


Figure 1.3: FTIR spectrum of the cold-ring fraction collected at 350°C

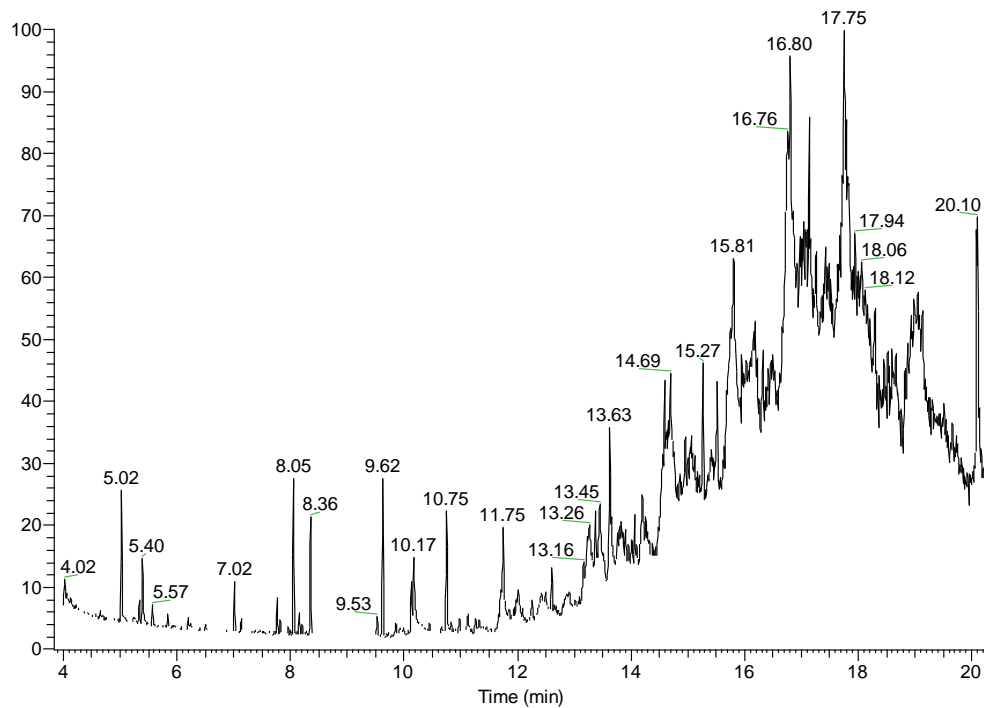


Figure 1.4: GC-MS chromatogram of the cold-ring fraction collected at 350°C

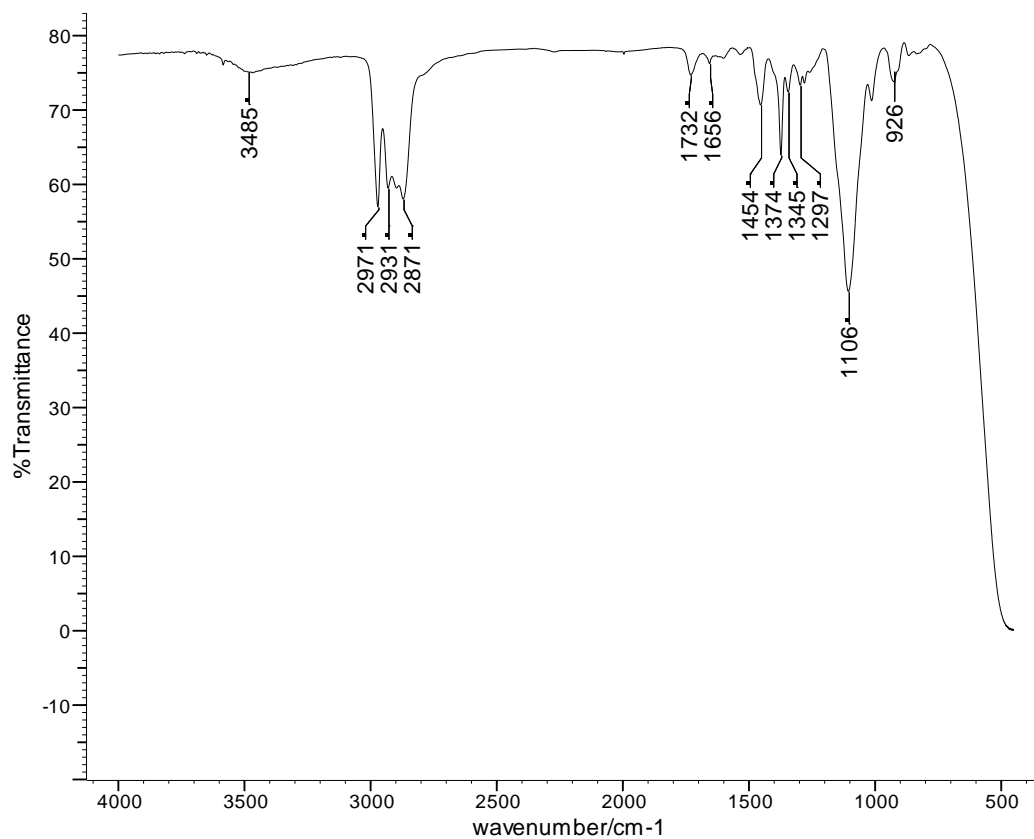


Figure1.5: FTIR spectrum of the cold-ring fraction collected at 400°C

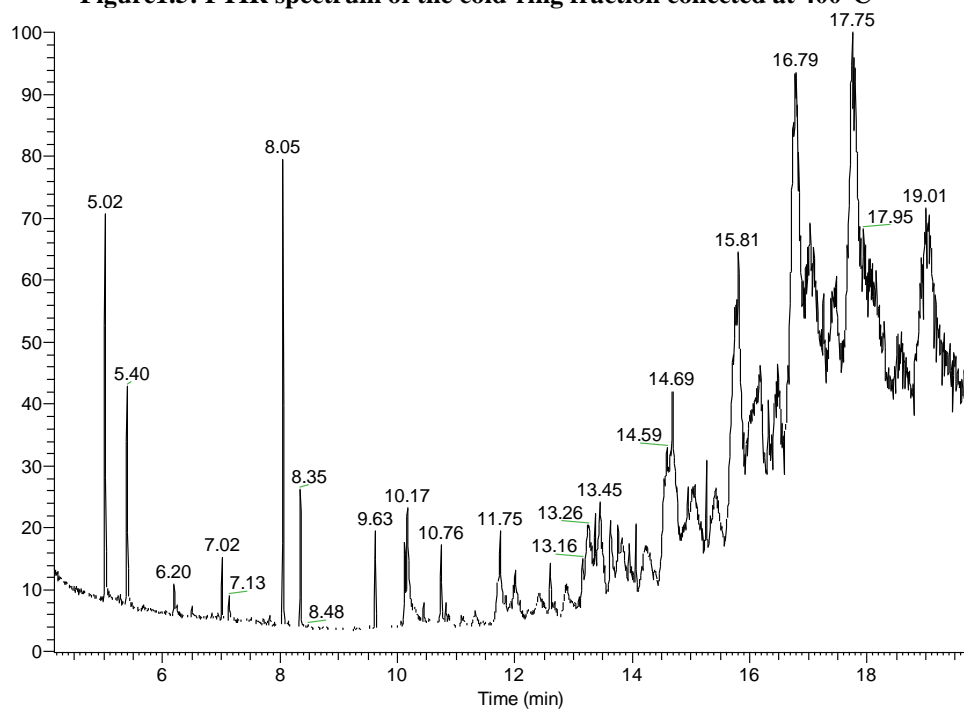


Figure 6: GC-MS chromatogram of the cold-ring fraction collected at 400°C

1.1.3 Residues

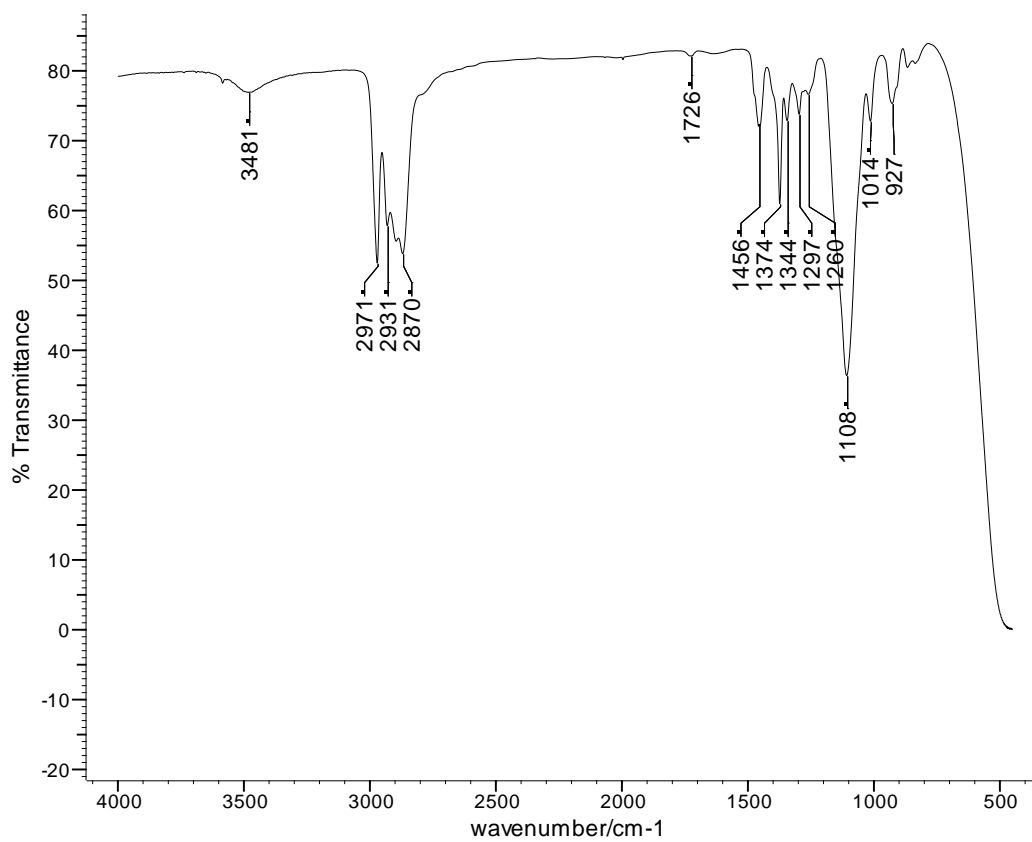


Figure 1.7: FTIR spectrum of the residue collected at 300°C

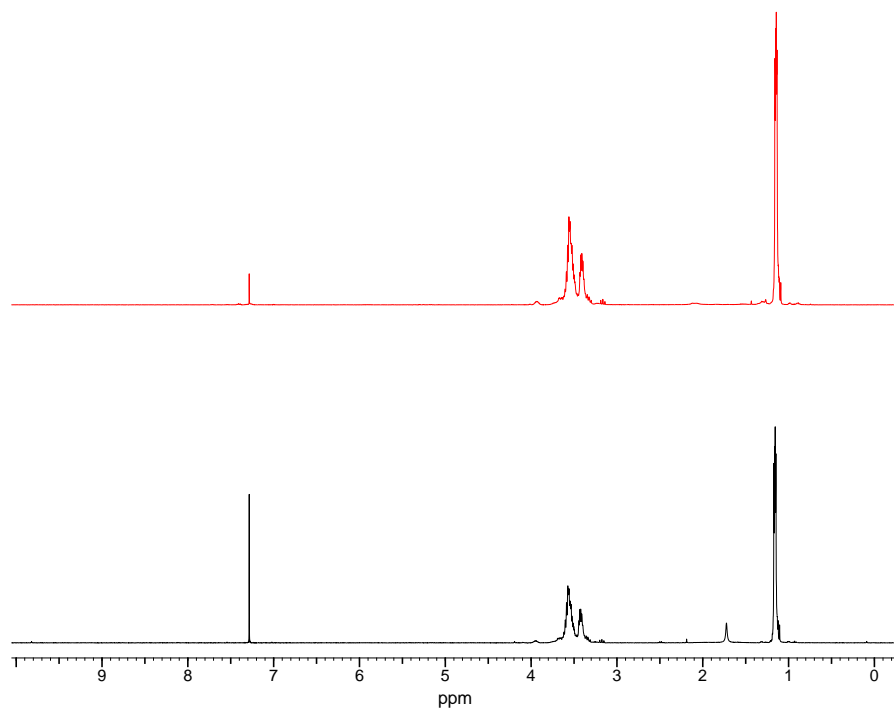


Figure 1.8: ^1H NMR spectrum of the residue at 300°C (black) and the polyol (red)

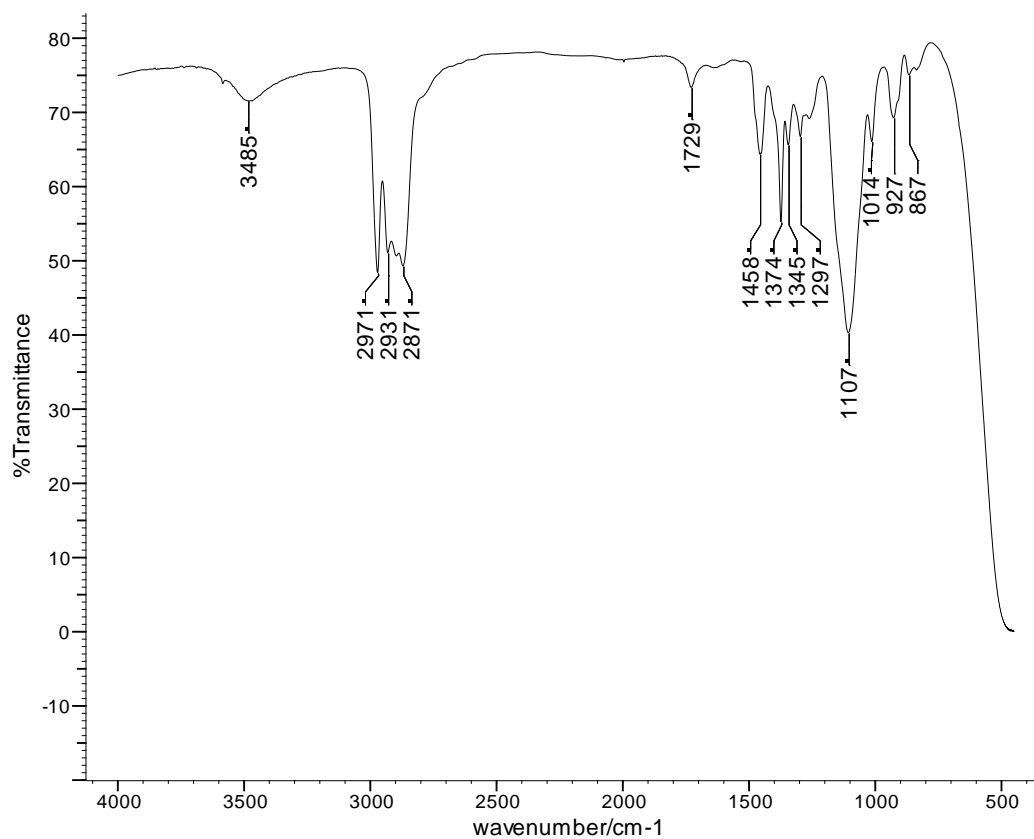


Figure 1.9: FTIR spectrum of the residue at 350°C

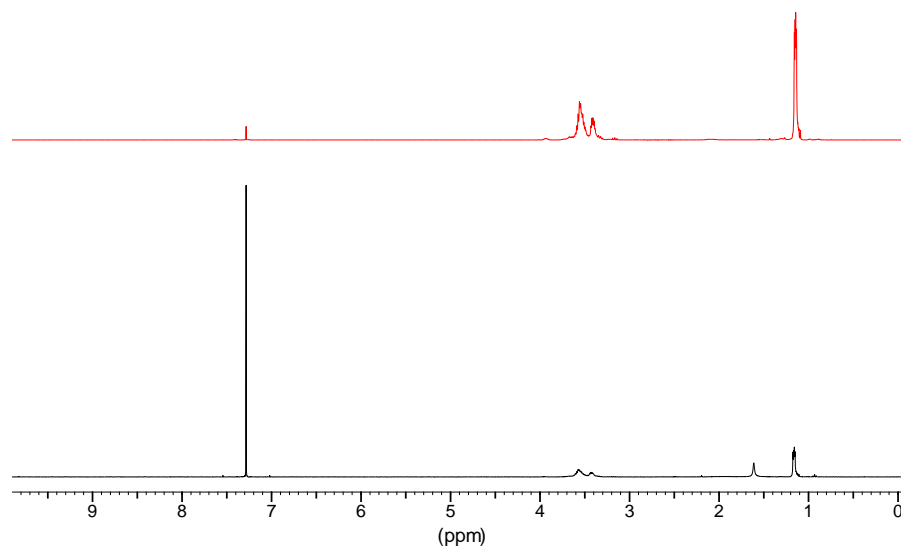


Figure 1.10: ¹H NMR spectrum of the residue at 350°C (black) and polyol (red)

1.1.4 Condensable Fraction

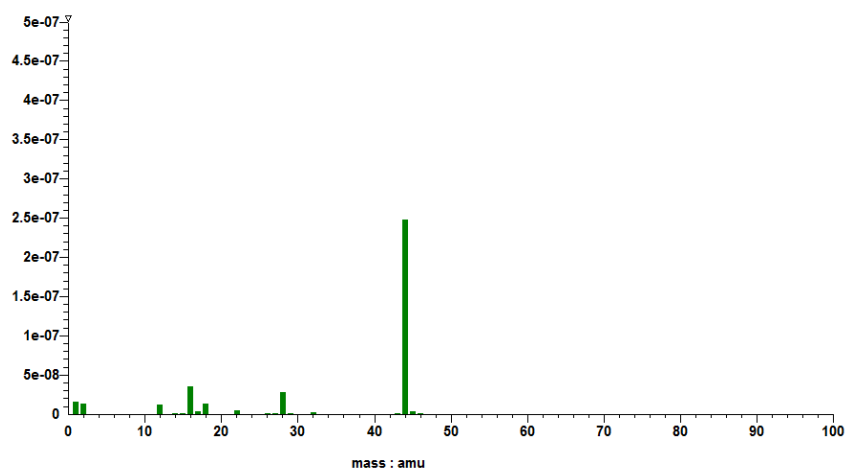


Figure 1.11: MS of CO₂ collected at 250°C

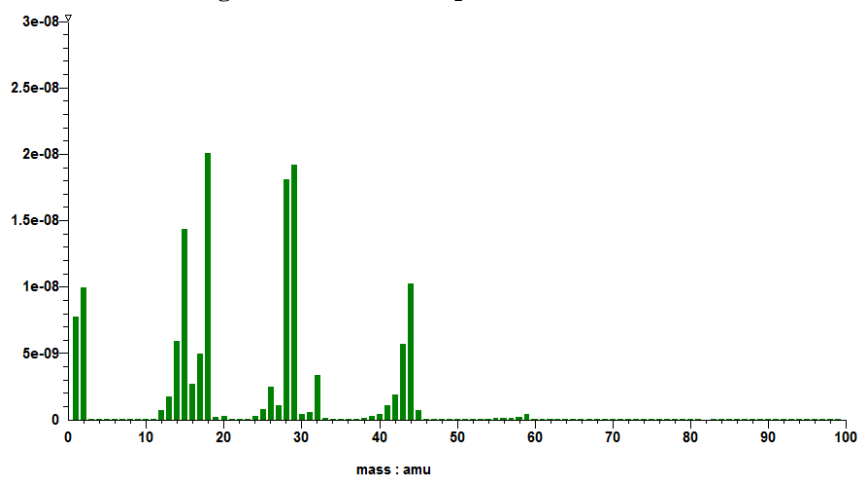


Figure 12: MS of acetaldehyde collected at 250°C

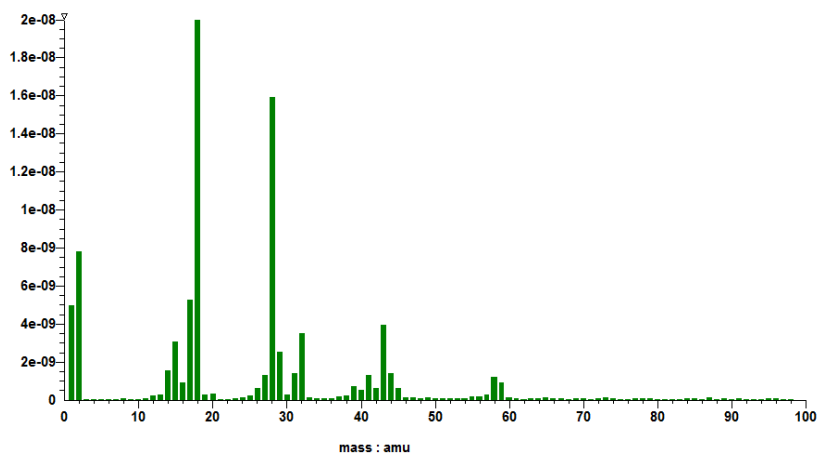


Figure 13: MS of C₃H₆O isomers collected at 250°C

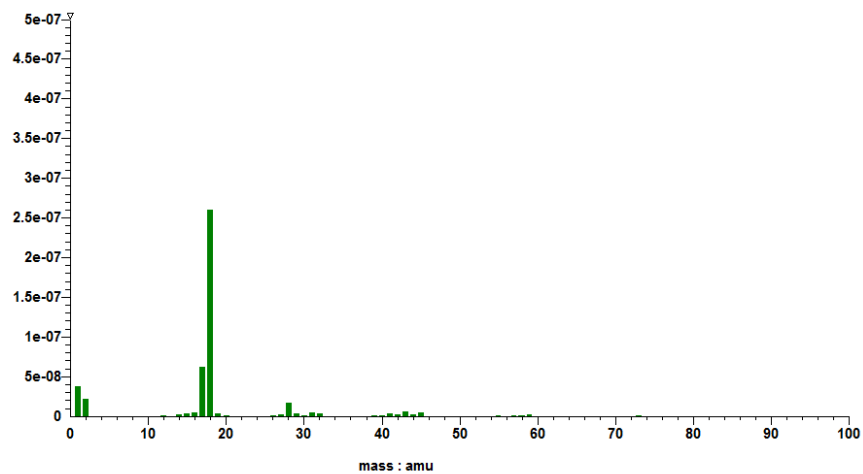


Figure 14: MS of water collected at 250°C

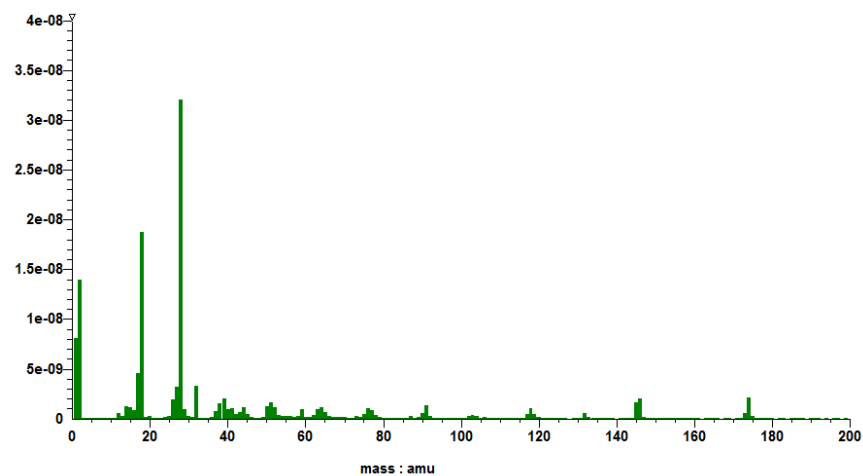


Figure 15: MS of high molar mass material collected at 250°C

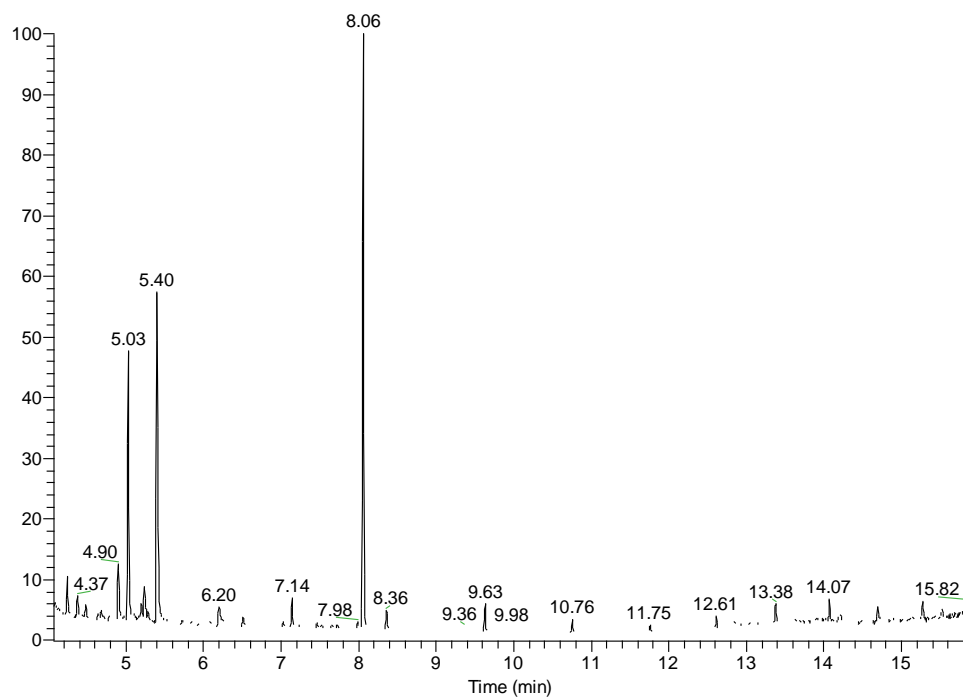


Figure 16: GC-MS chromatogram of fraction 4 at 250°C

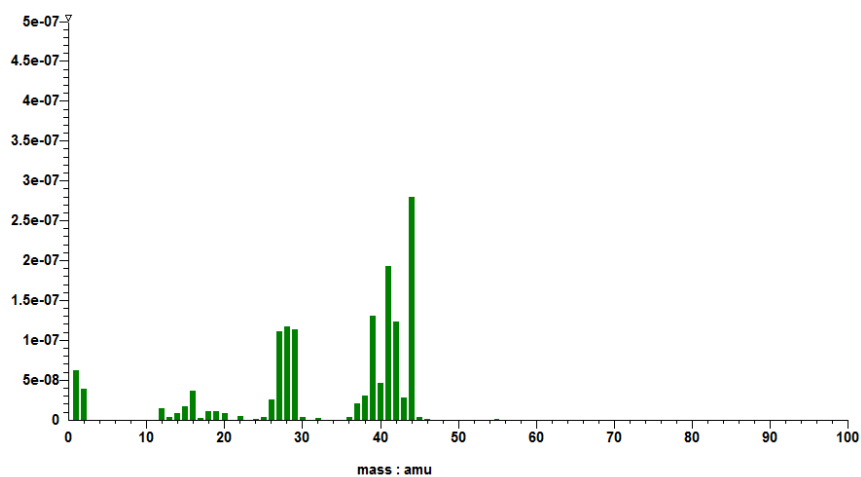


Figure 17: MS of propene and CO₂ collected at 300°C

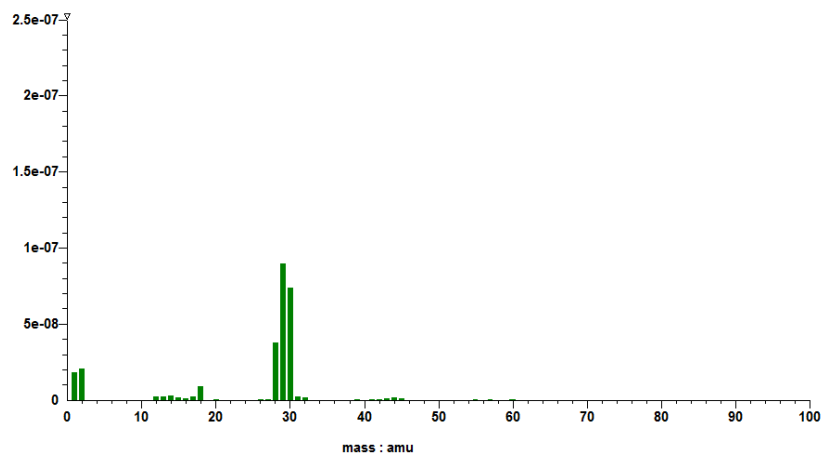


Figure 18: MS of formaldehyde collected at 300°C

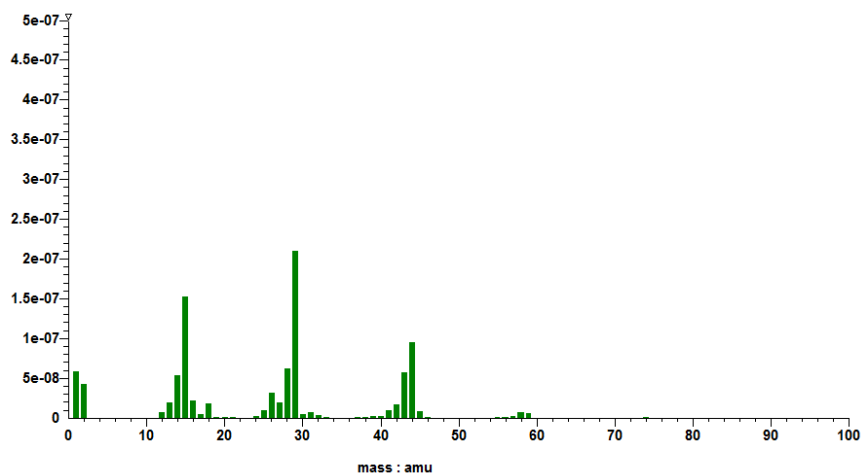


Figure 19: MS of acetaldehyde collected at 300°C

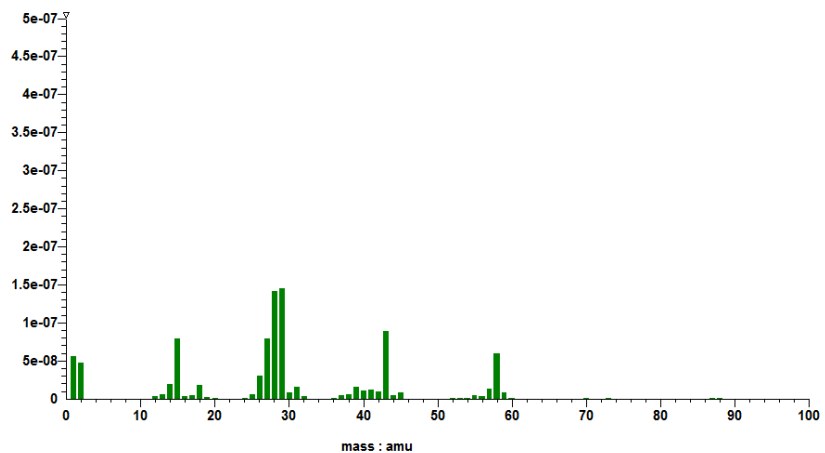


Figure 20: MS of C₃H₆O isomers collected at 300°C

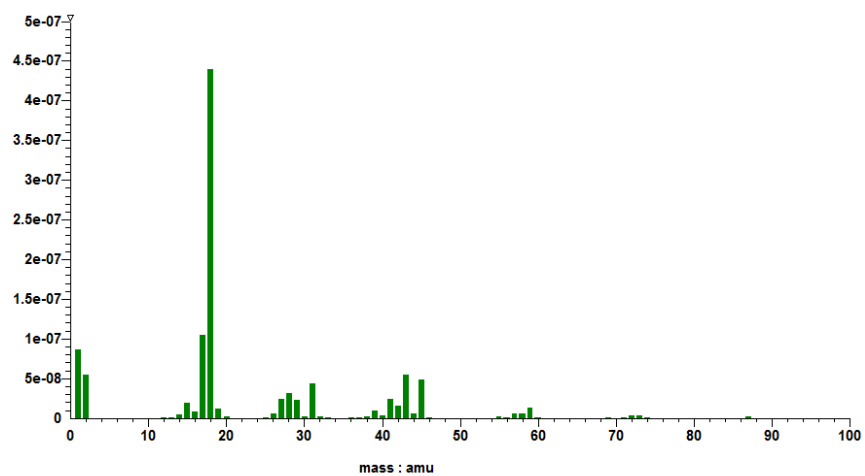


Figure 21: MS of water and high molar mass material collected at 300°C

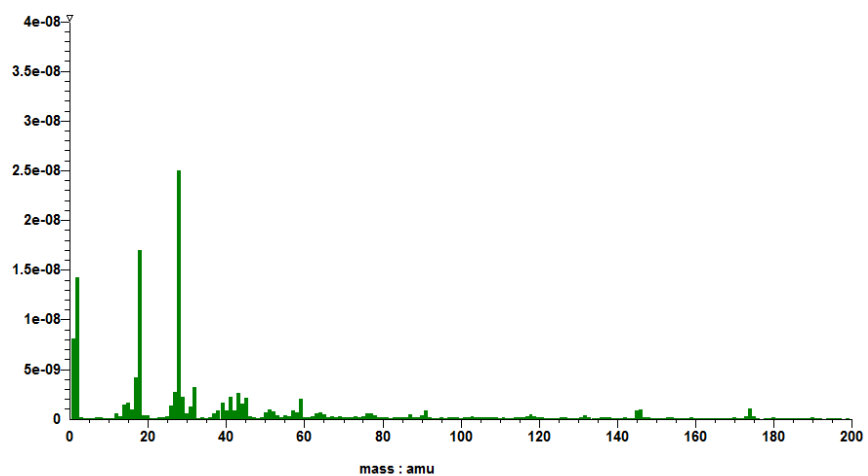


Figure 22: MS of high molar mass material collected at 300°C

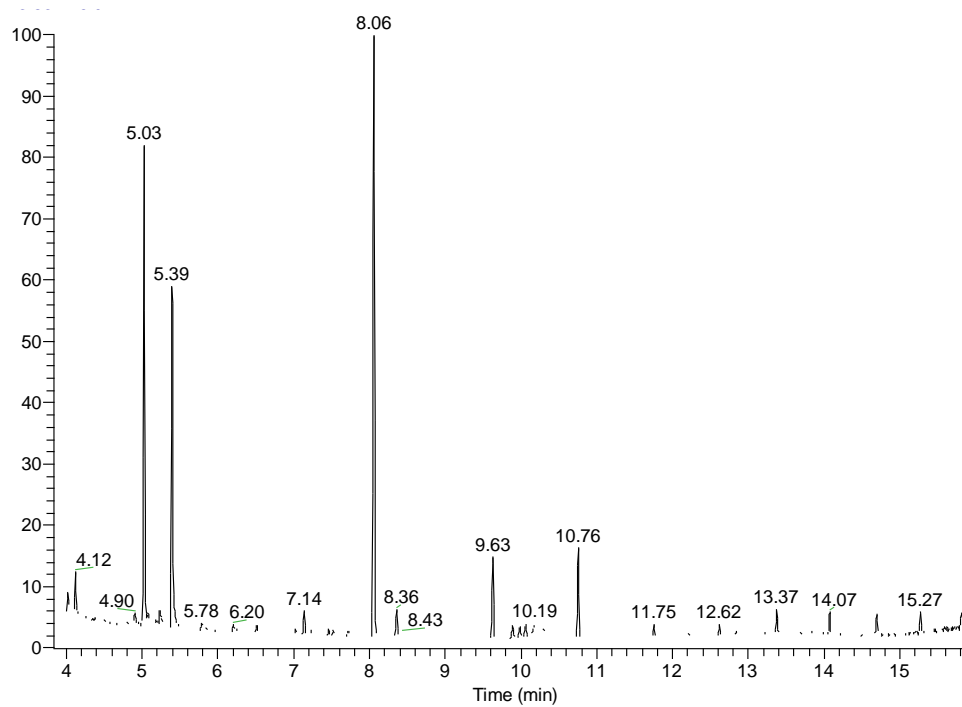


Figure 23: GC-MS chromatogram of fraction 4 at 300°C

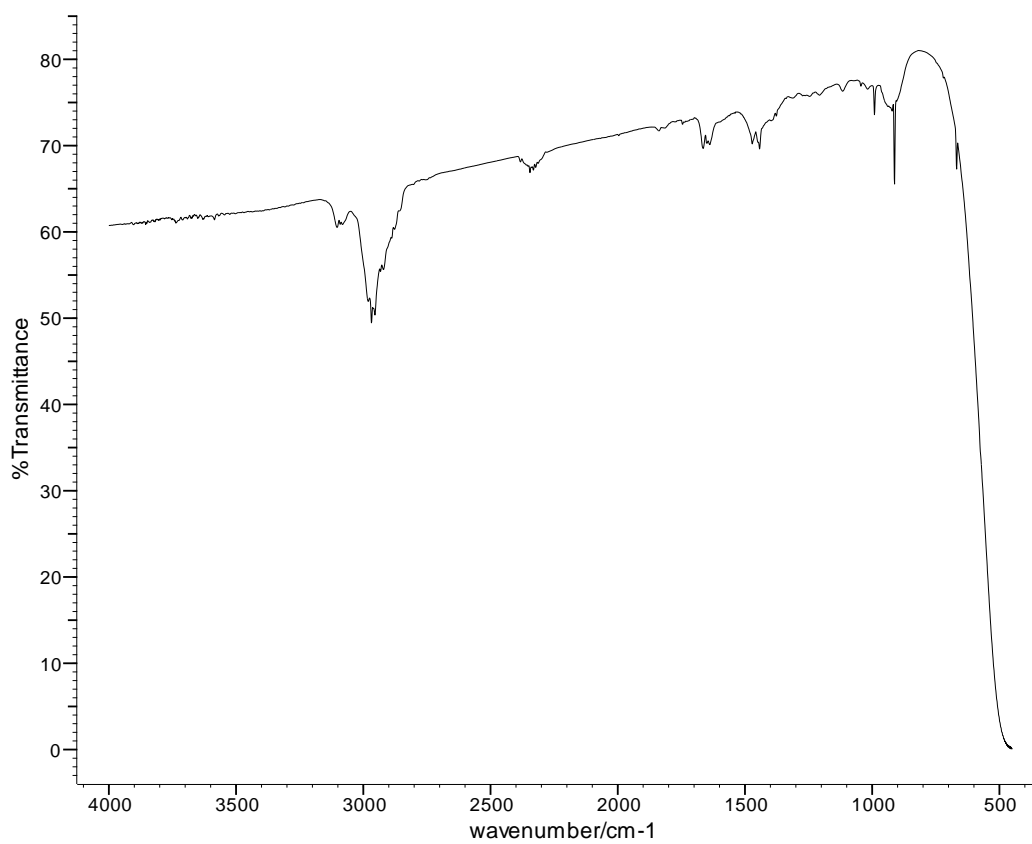
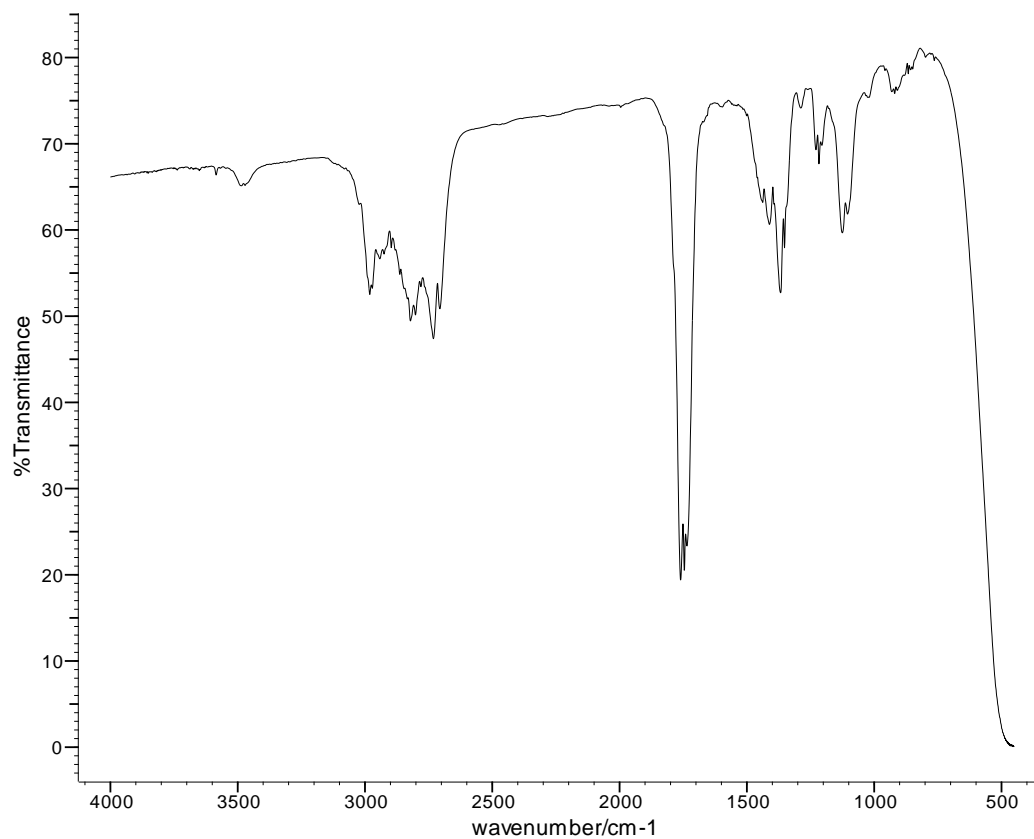
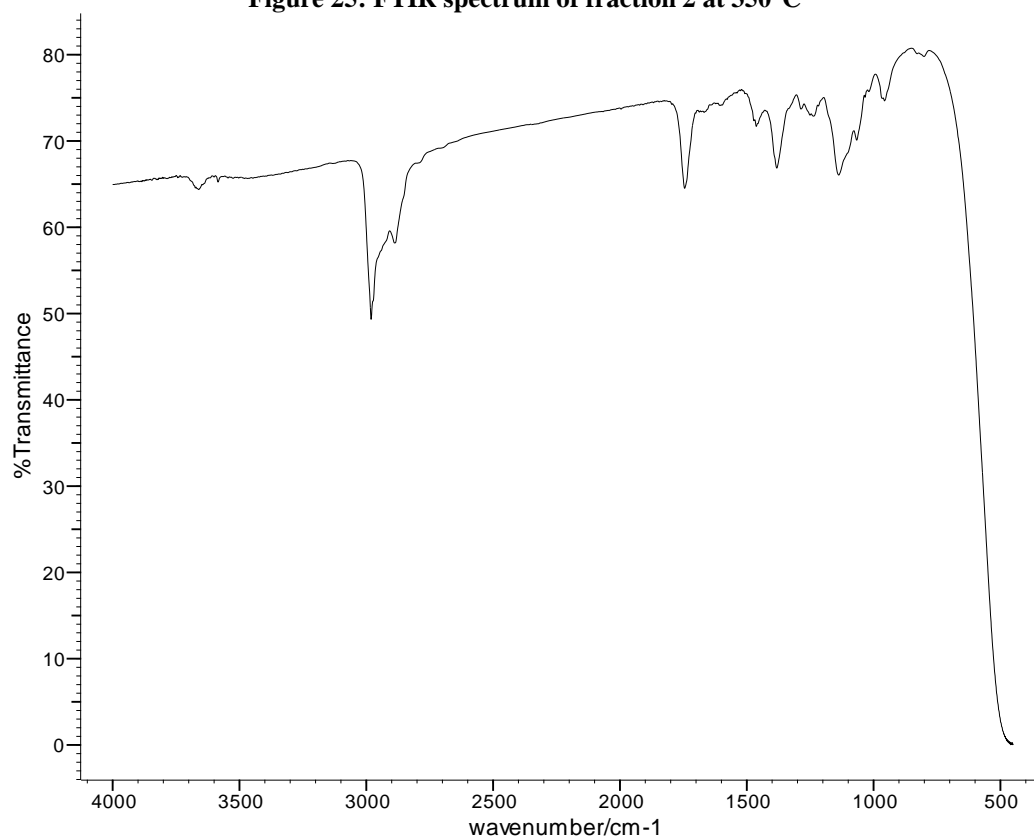


Figure 24: FTIR spectrum of fraction 1 at 350°C

**Figure 25: FTIR spectrum of fraction 2 at 350°C****Figure 26: FTIR spectrum of fraction 3 at 350°C**

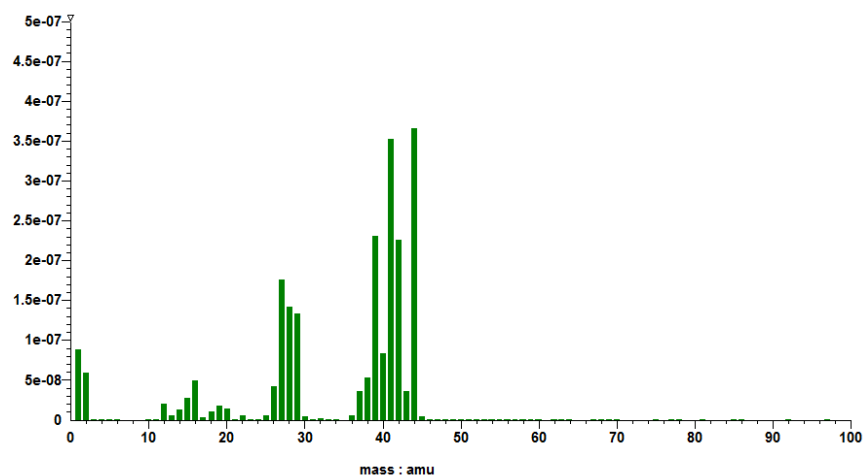


Figure 27: MS of propene and CO₂ collected at 350°C

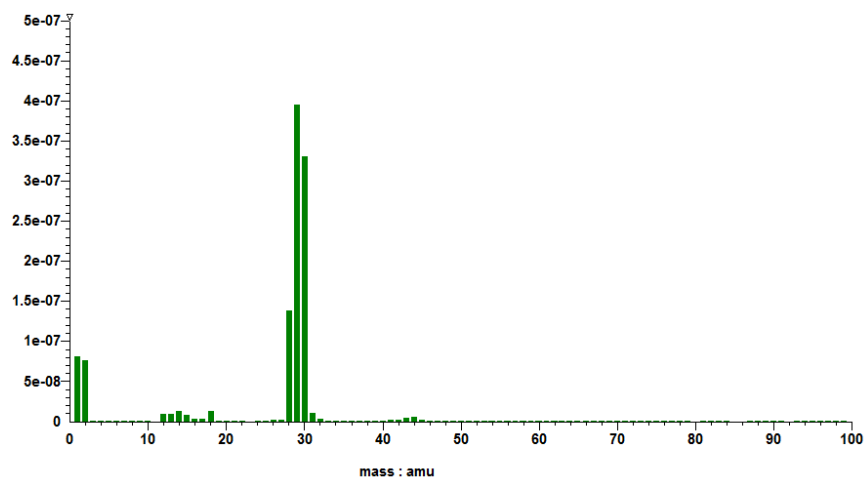


Figure 28: MS of formaldehyde collected at 350°C

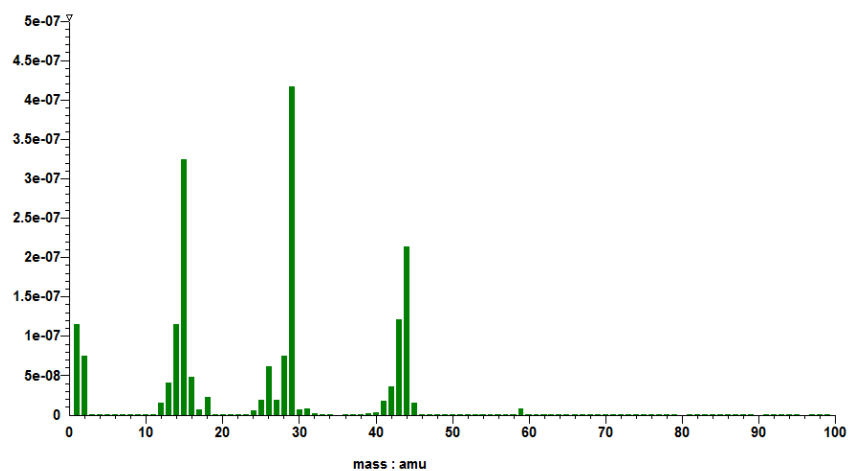


Figure 29: MS of acetaldehyde collected at 350°C

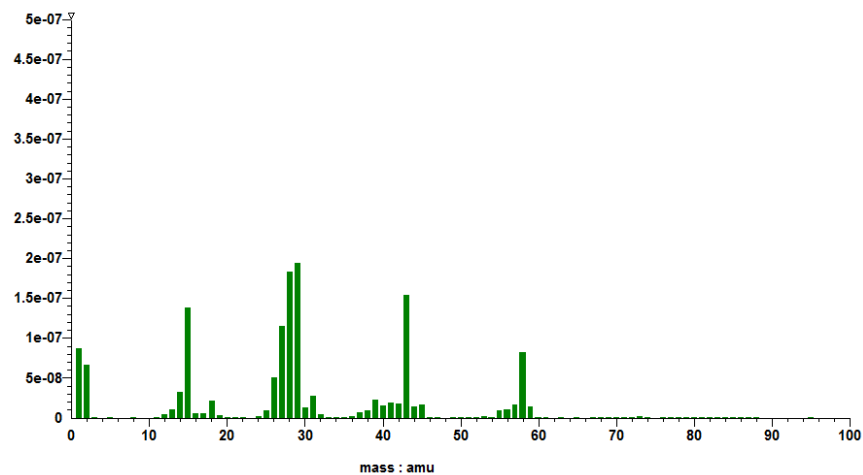


Figure 30: MS of C_3H_6O isomers collected at 350°C

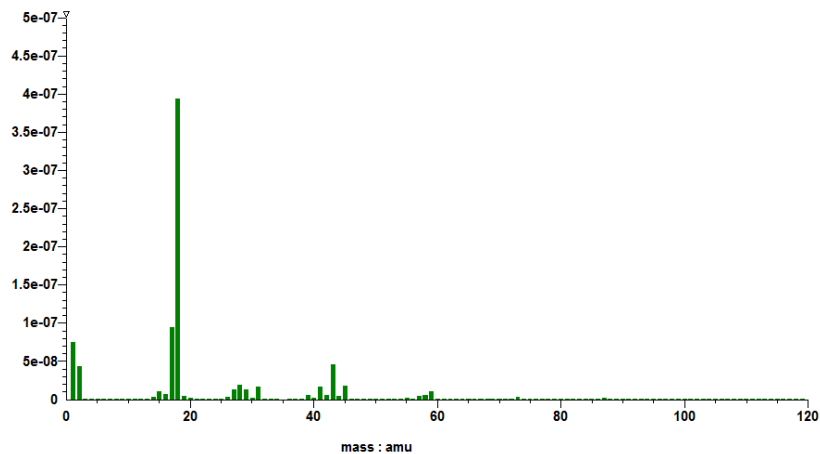


Figure 31: MS of water and higher molar mass material collected at 350°C

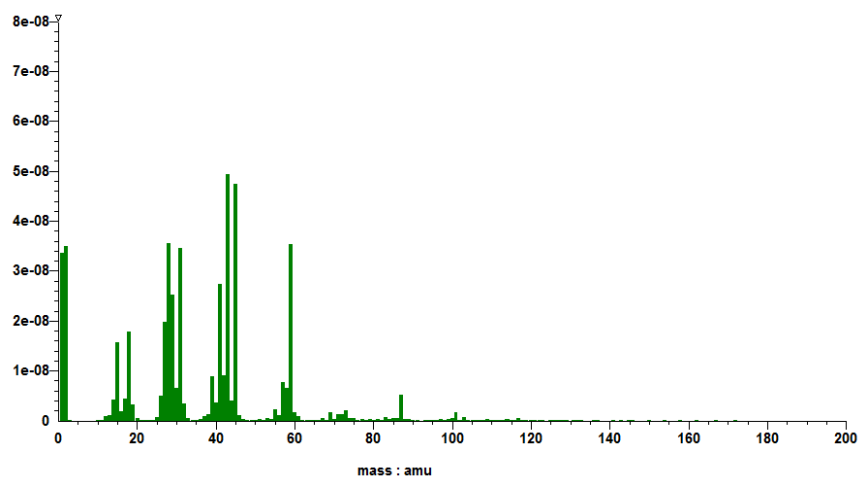


Figure 32: MS of high molar mass material collected at 350°C

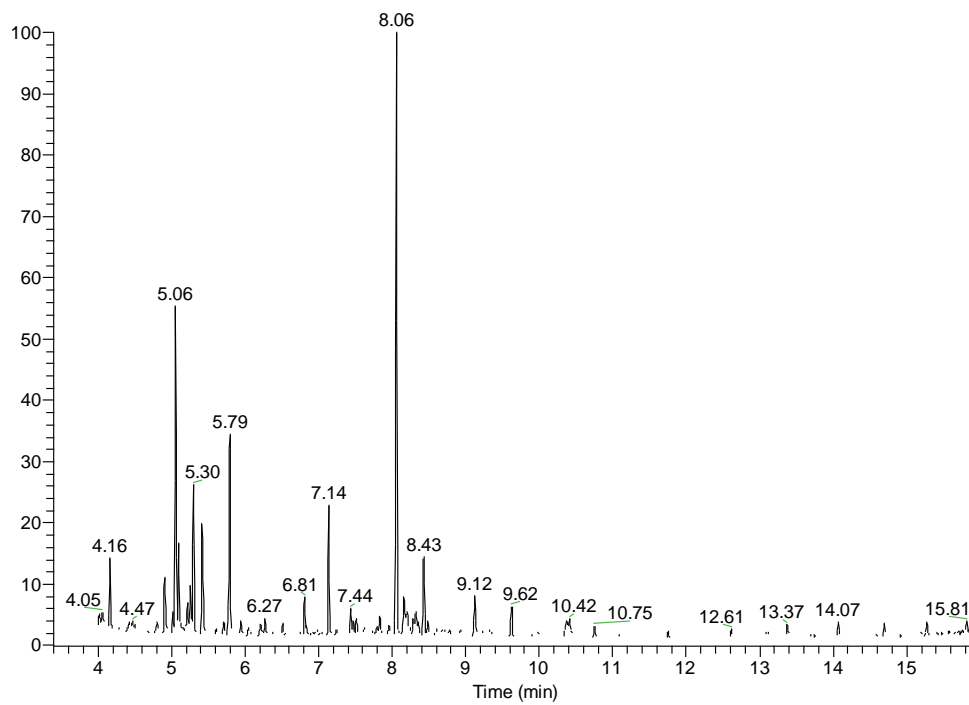


Figure 33: GC-MS chromatogram of fraction 4 at 350°C

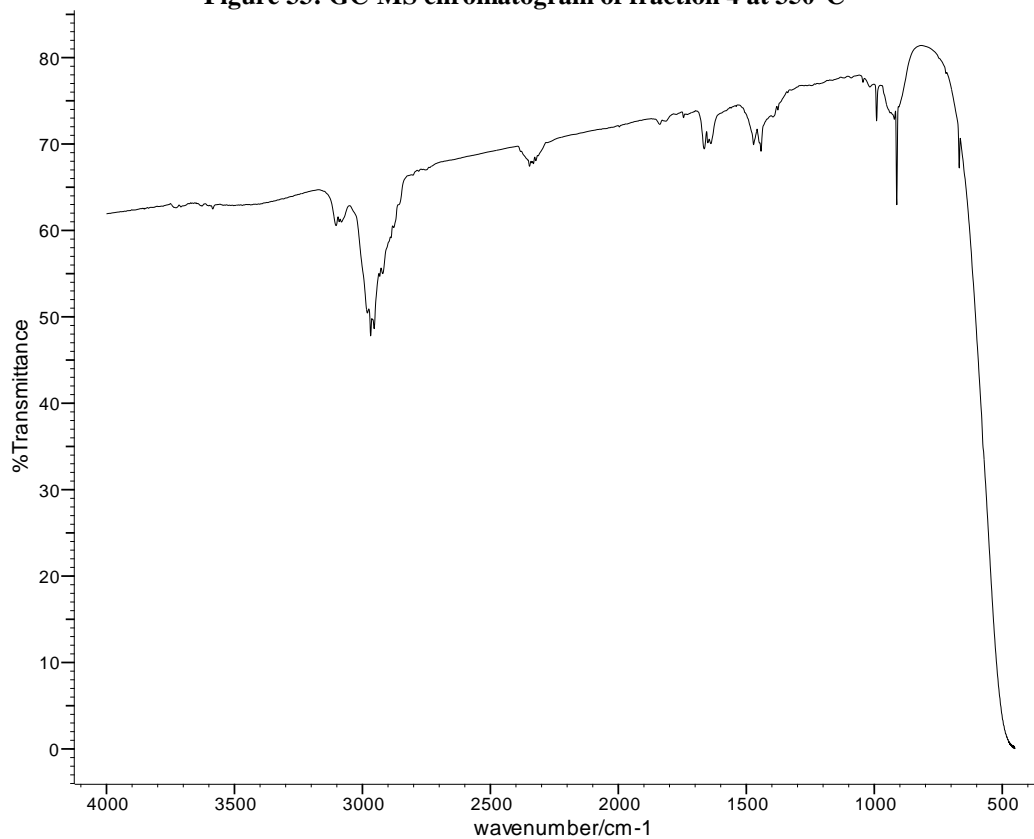


Figure 34: FTIR spectrum of fraction 1 at 400°C

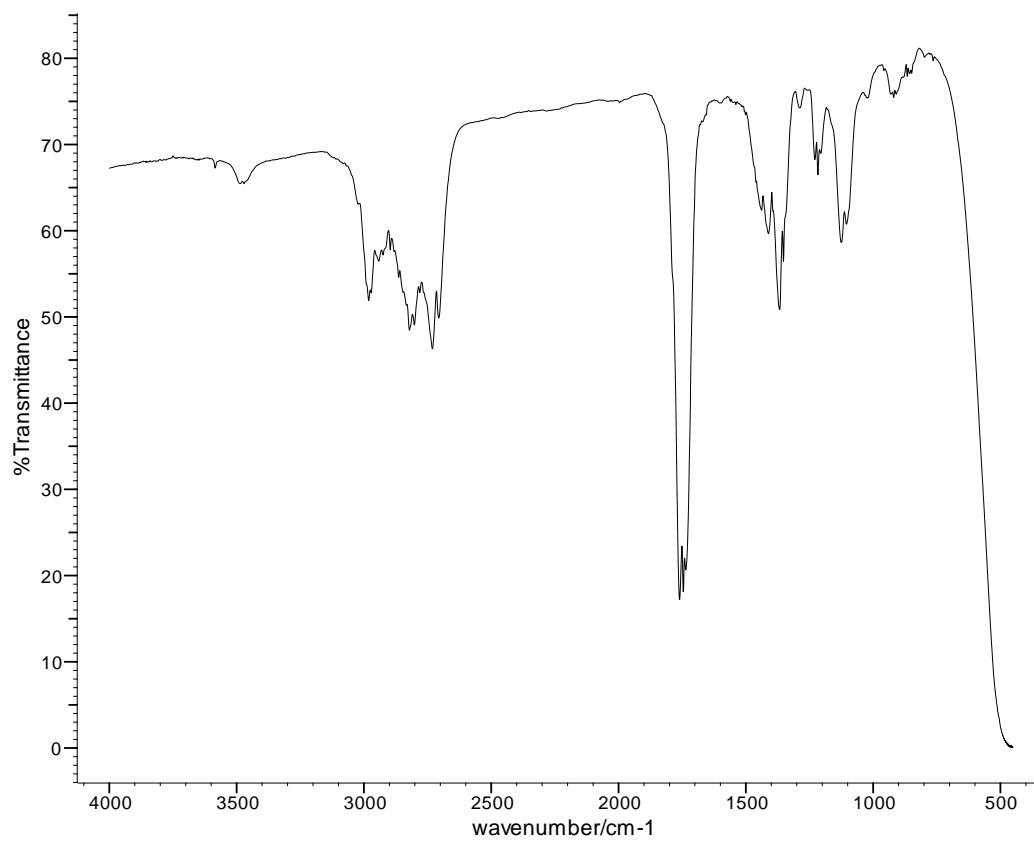


Figure 35: FTIR spectrum of fraction 2 at 400°C

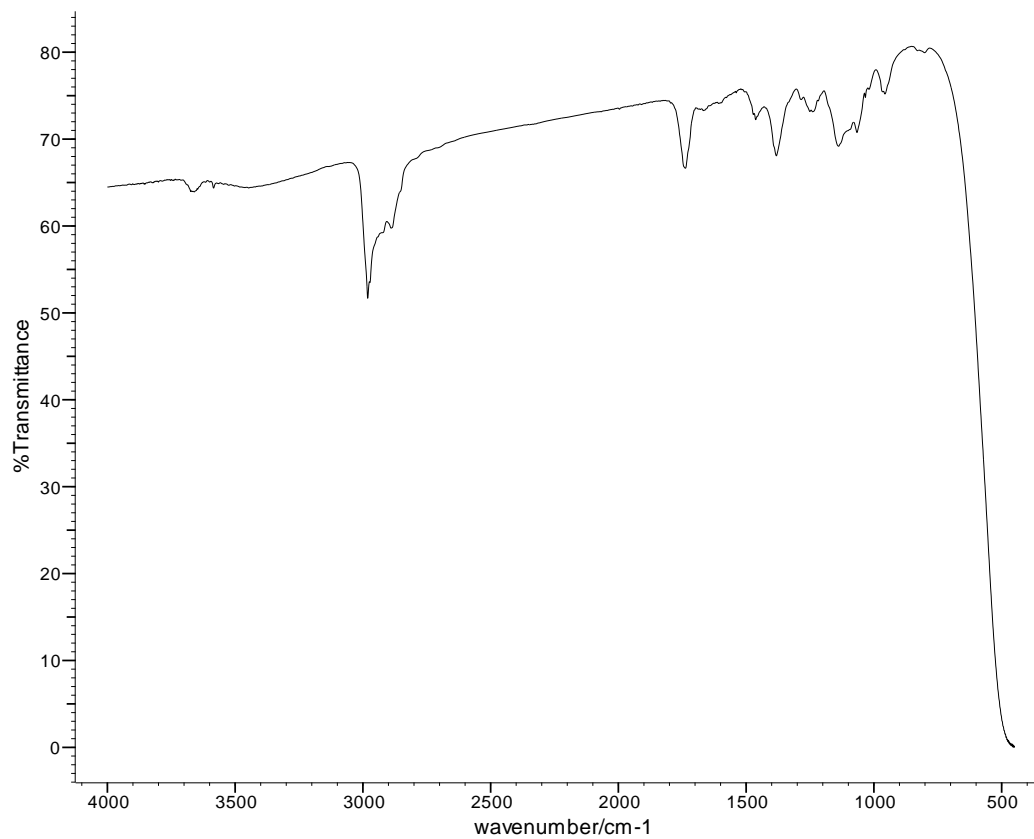


Figure 36: FTIR spectrum of fraction 3 at 400°C

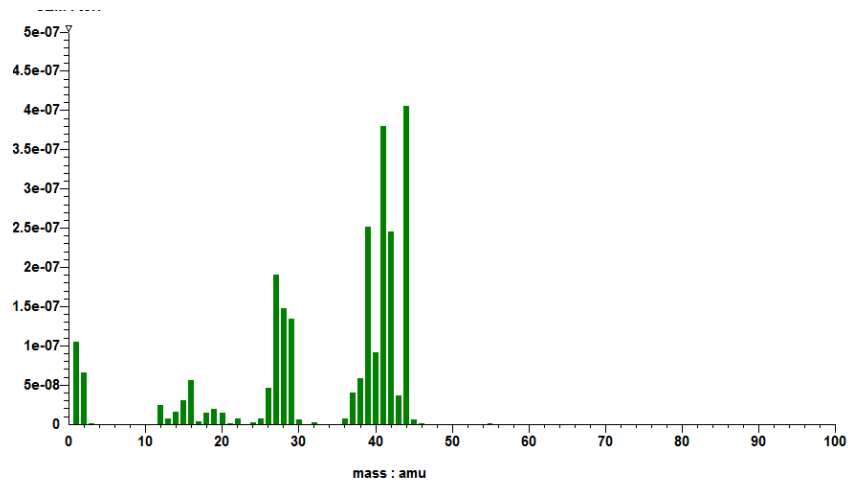
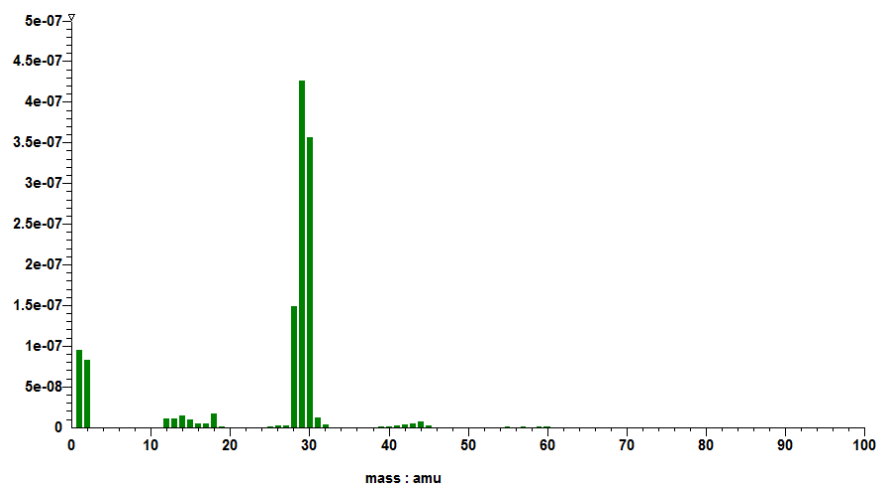
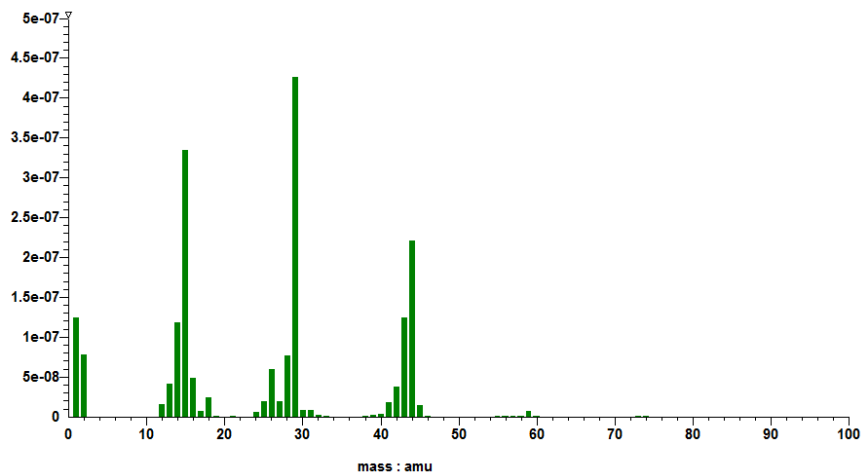
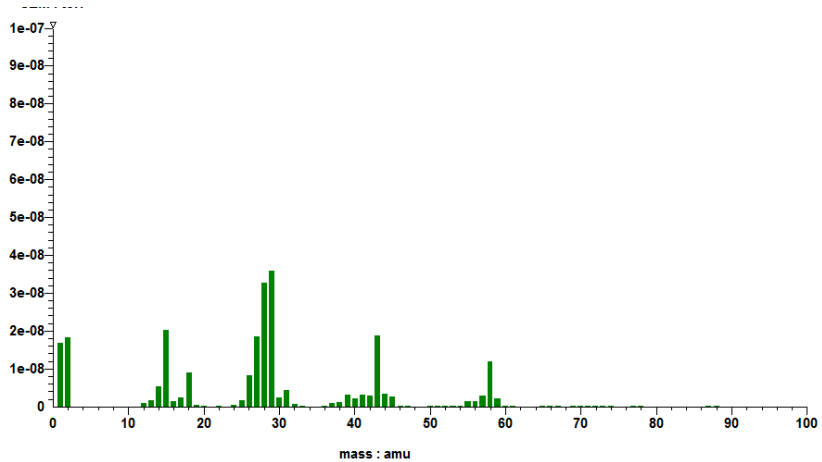


Figure 37: MS of propene and CO₂ collected at 400°C

**Figure 38: MS of formaldehyde collected at 400°C****Figure 39: MS of acetaldehyde collected at 400°C****Figure 40: MS of C₃H₆O isomers collected at 400°C**

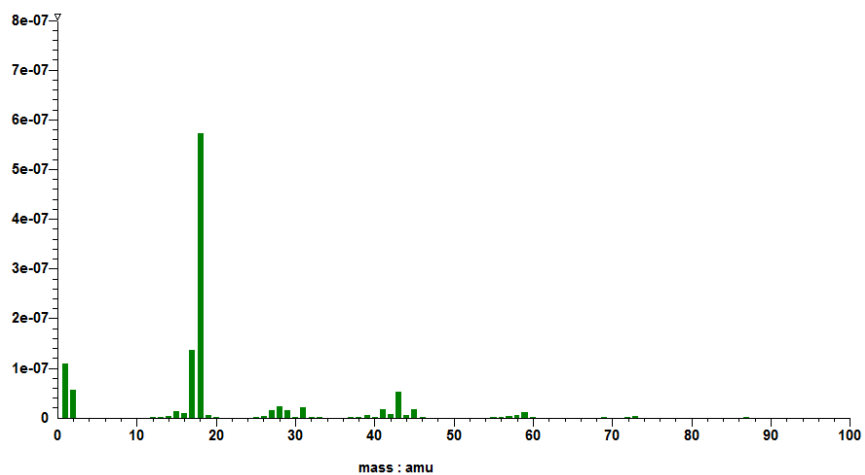


Figure 41: MS of water and high molar mass material at 400°C

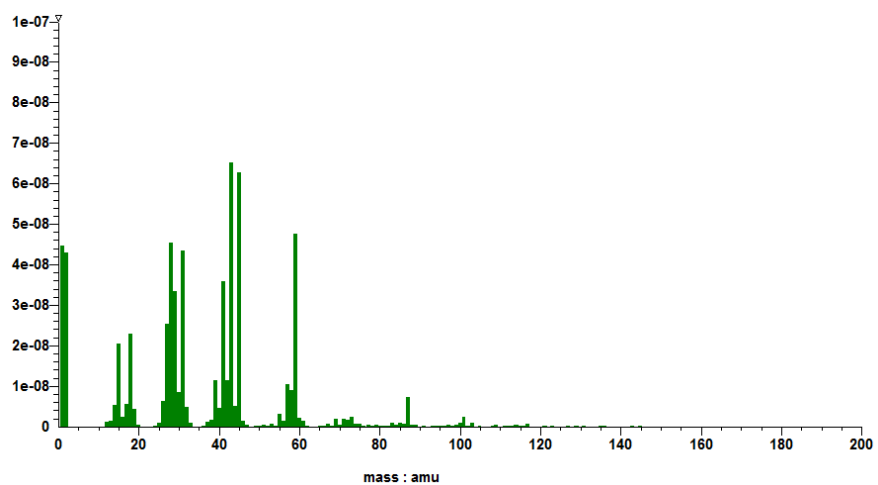


Figure 42: MS of high molar mass material at 400°C

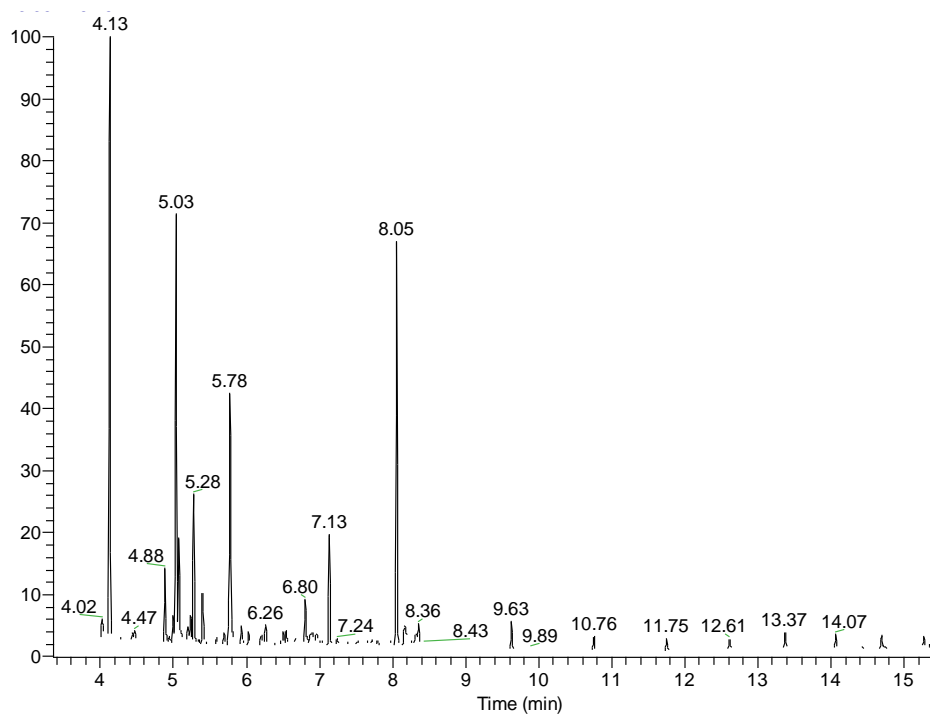


Figure 43: GC-MS chromatogram of fraction 4 at 400°C

1.1.5 TVA of Polyol

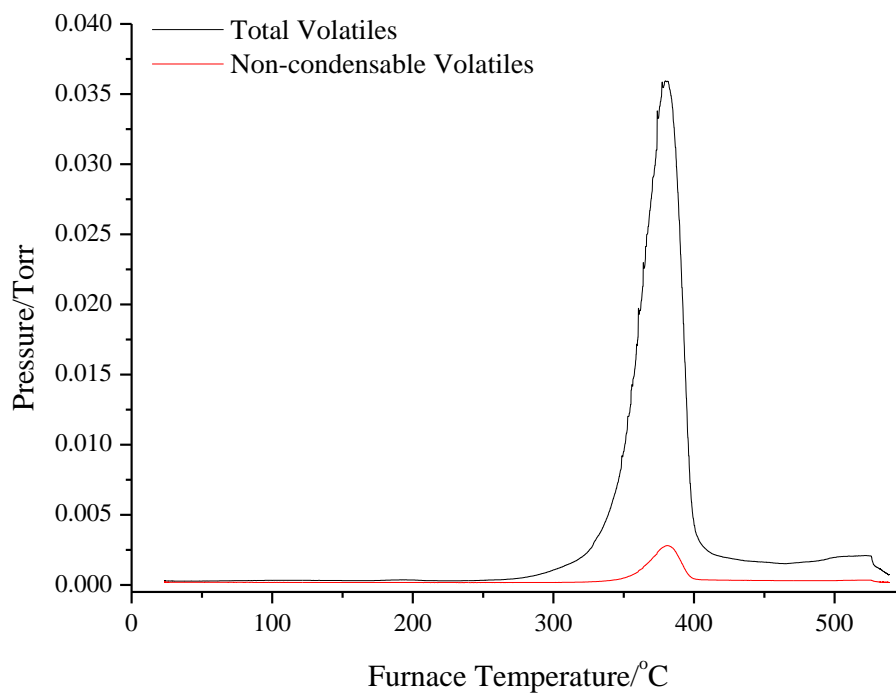


Figure 44: TVA degradation profile of neat polyol

1.2 Pyrolysis under nitrogen

1.2.1 Cold-ring fractions

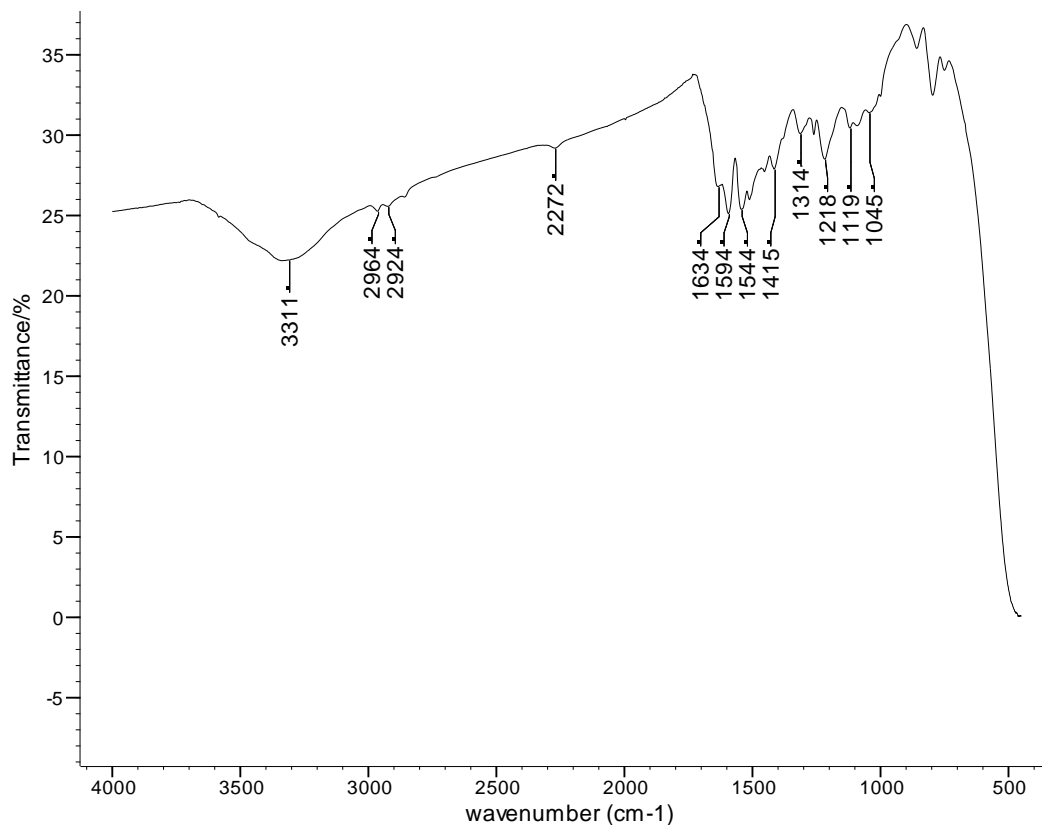


Figure 45: FTIR spectrum of the white insoluble cold-ring fraction collected from the standard foam under nitrogen

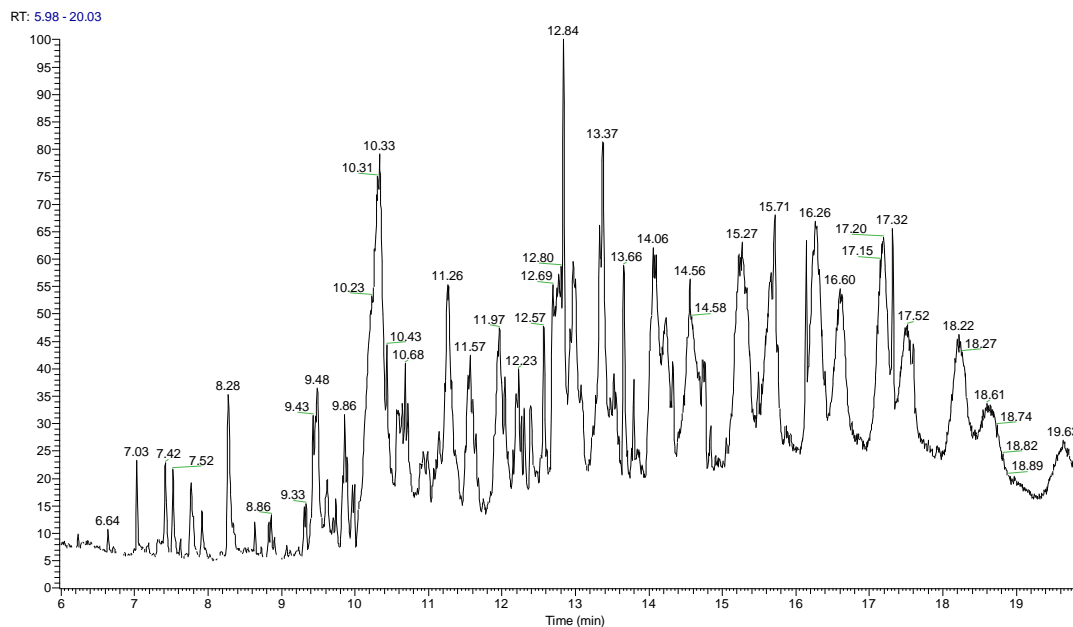


Figure 46: GC-MS chromatogram of the cold-ring fraction collected under nitrogen at 300°C

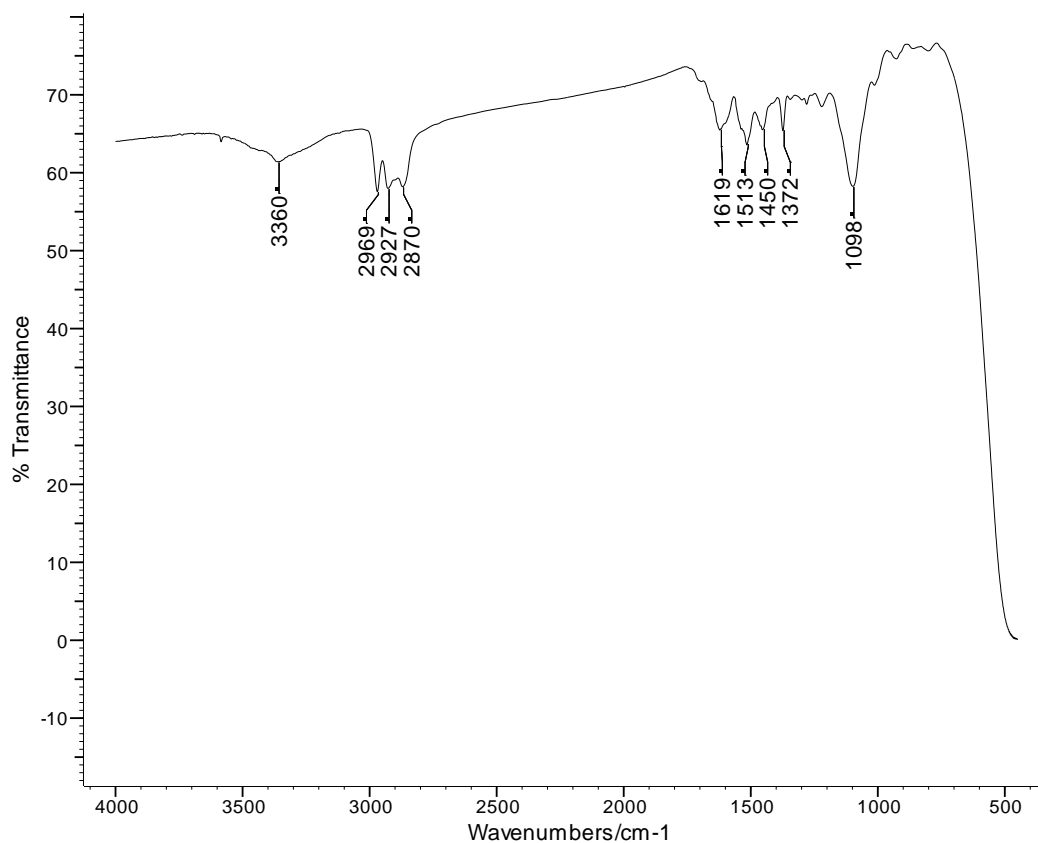


Figure 47: FTIR spectrum of the cold-ring fraction collected under nitrogen at 350°C

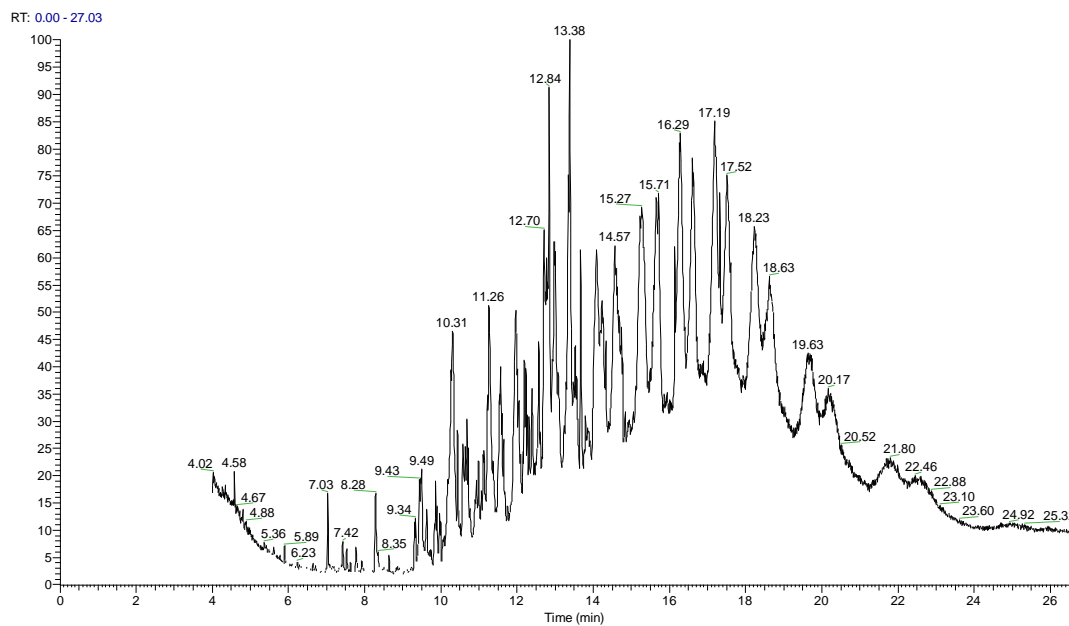


Figure 48: GC-MS chromatogram of the cold-ring fraction collected under nitrogen at 400°C

1.2.2 Tars

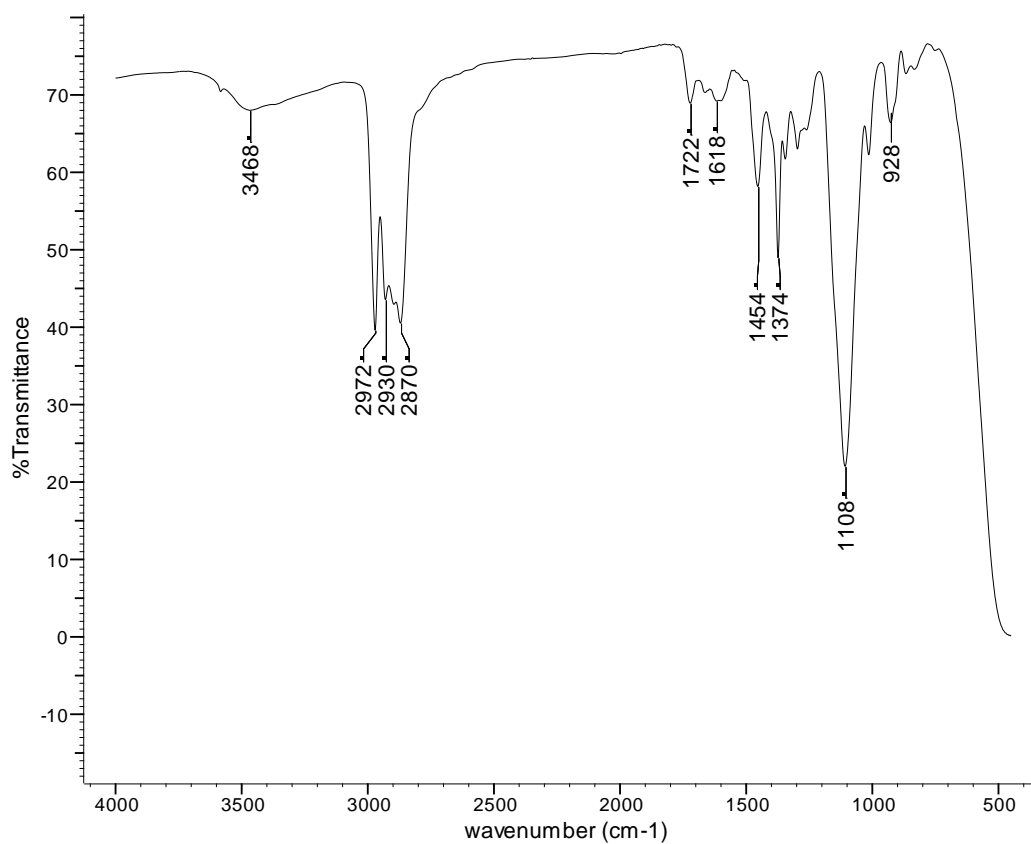


Figure 49: FTIR spectrum of the tar extracted at 350°C under nitrogen

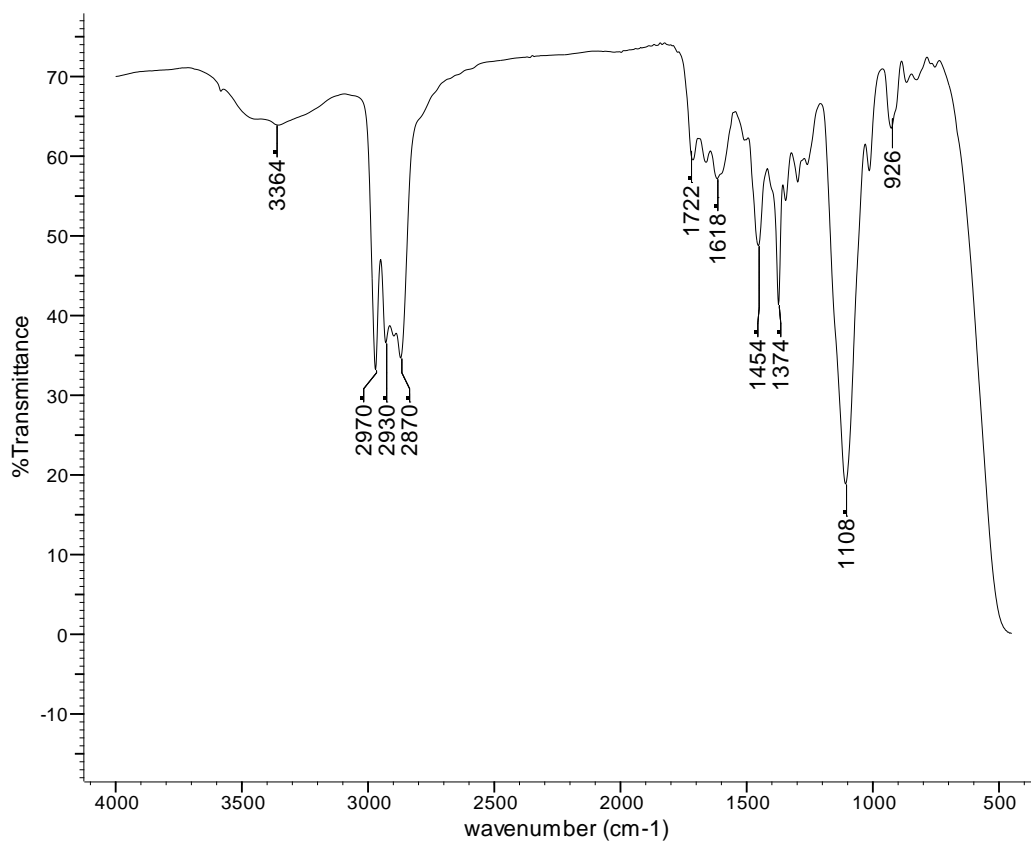


Figure 50: FTIR spectrum of the tar extracted at 400°C under nitrogen

1.3 Pyrolysis under air

1.3.1 Cold-ring Fractions

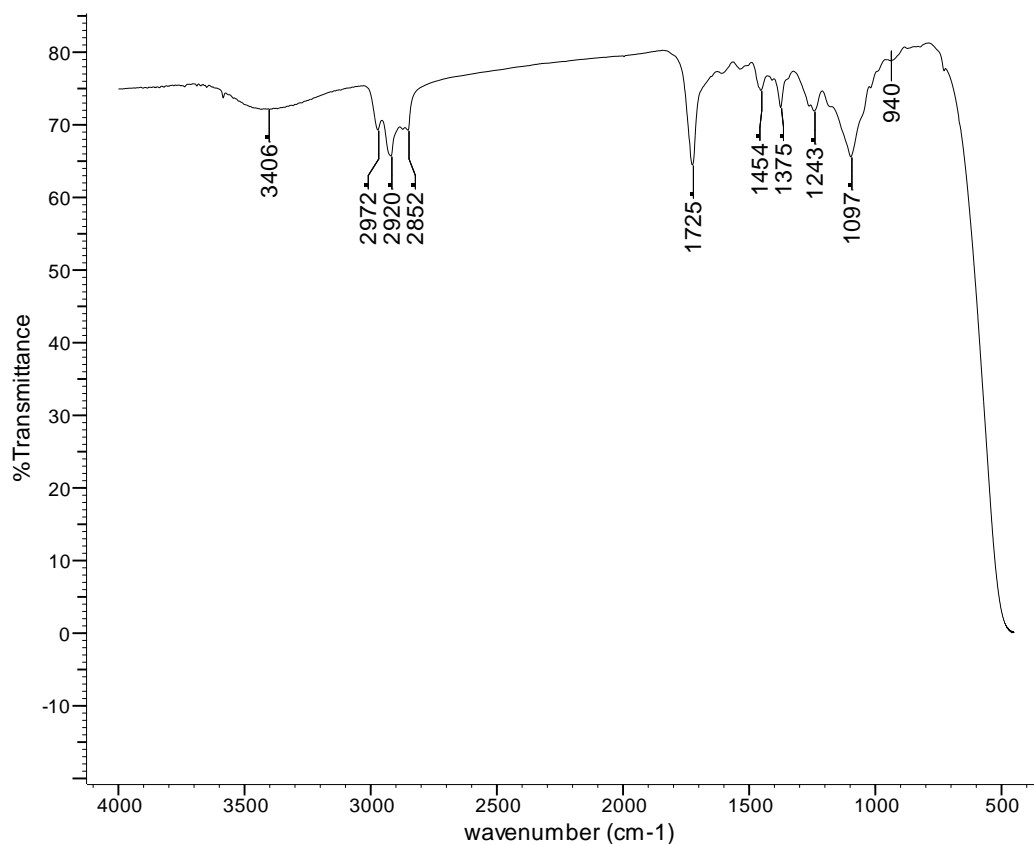


Figure 51: FTIR spectrum of the cold-ring fraction collected under air at 300°C

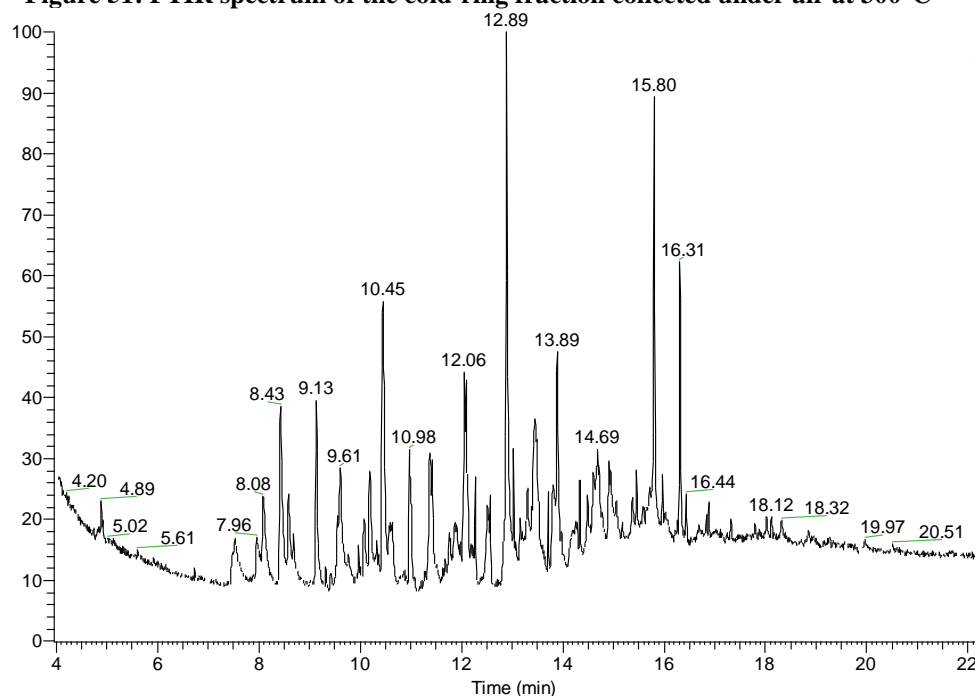


Figure 52: GC-MS total-ion chromatogram for the cold-ring fraction collected under air at 300°C

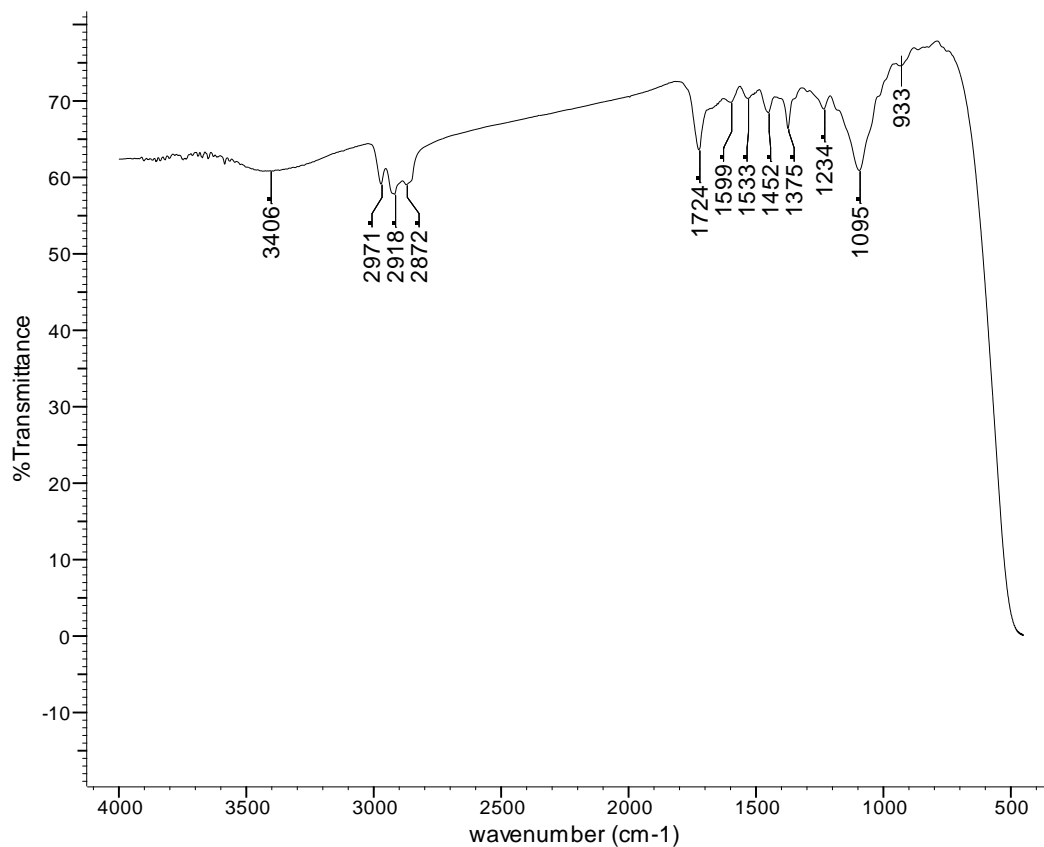


Figure 53: FTIR spectrum of the cold-ring fraction collected under air at 350°C

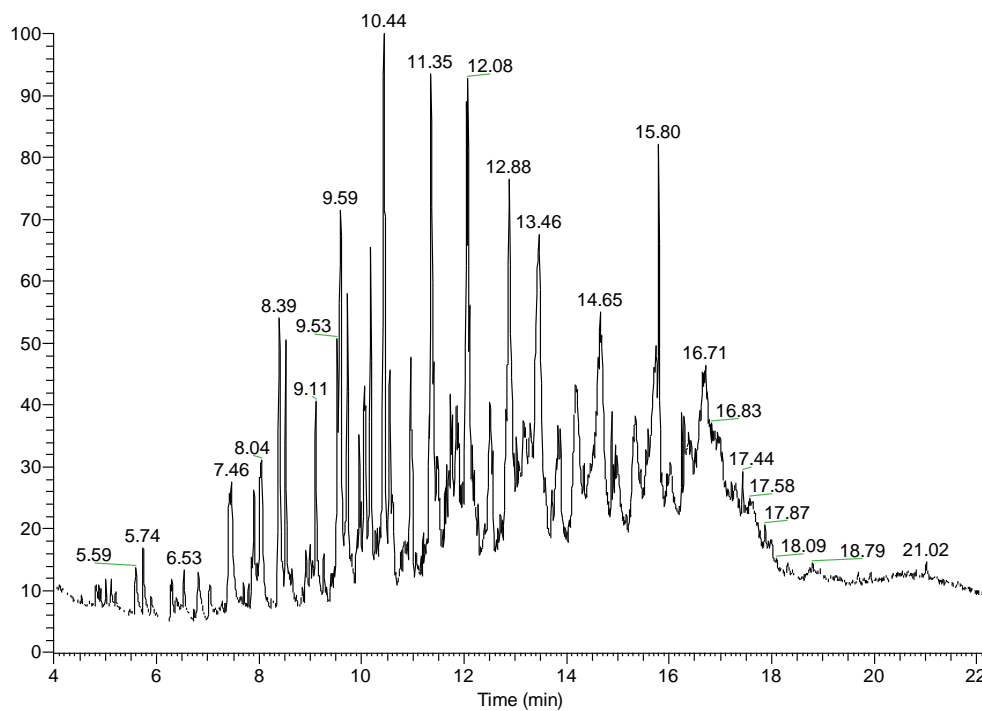


Figure 54: GC-MS total-ion chromatogram for the cold-ring fraction collected under air at 350°C

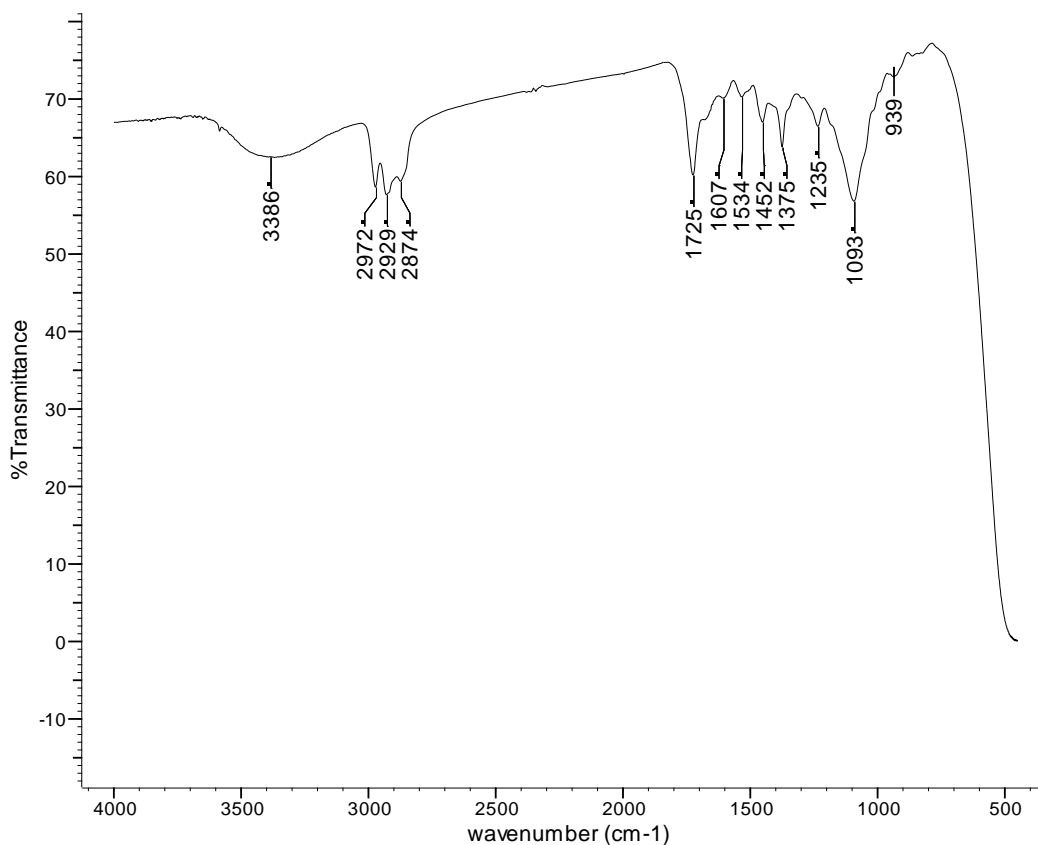


Figure 55: FTIR spectrum of the cold-ring fraction collected under air at 400°C

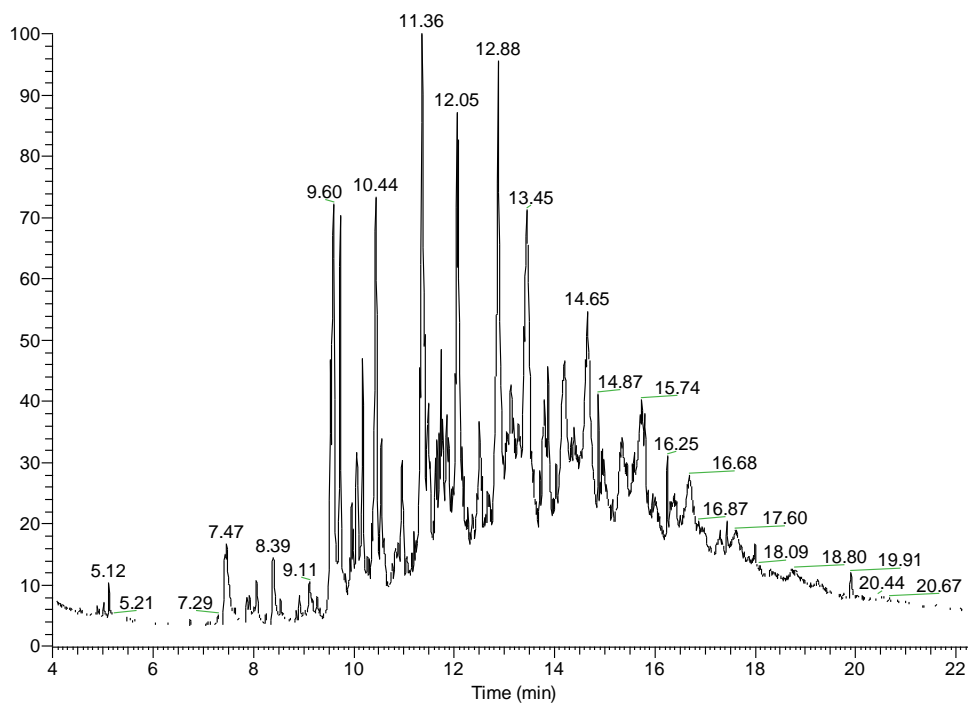


Figure 56: GC-MS total-ion chromatogram for the cold-ring fraction collected under air at 400°C

1.3.2 Tars

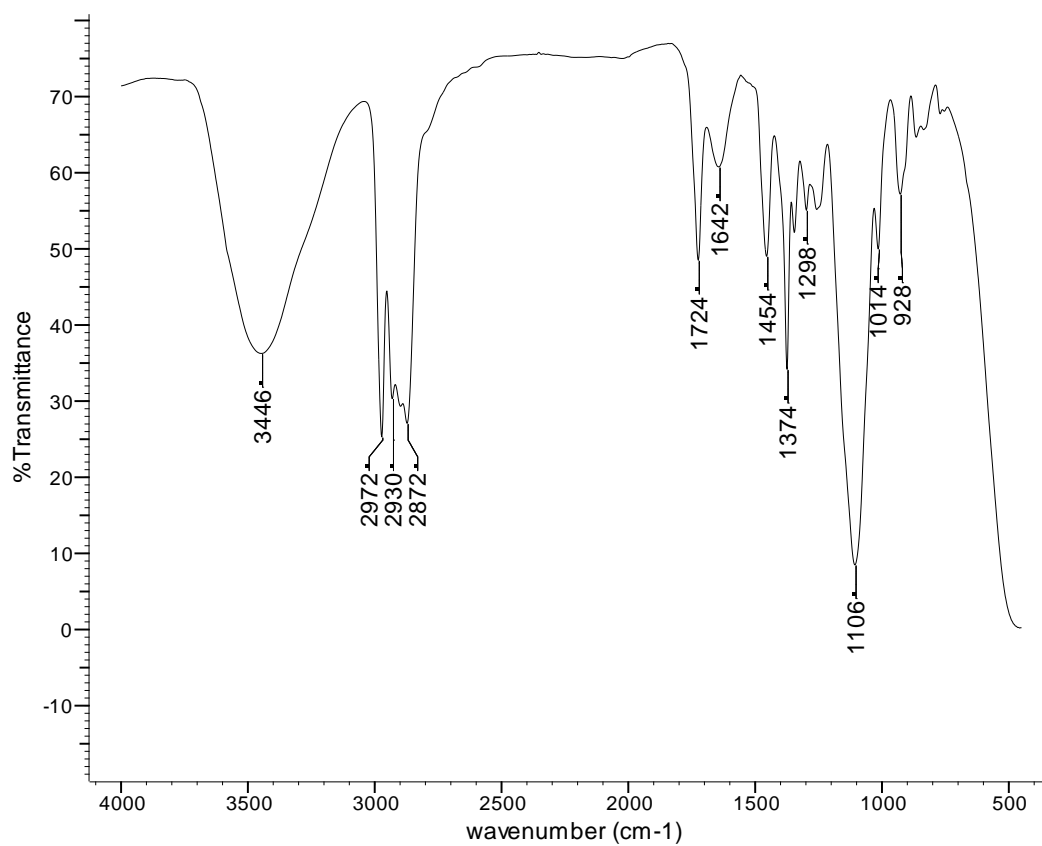


Figure 57: FTIR spectrum of the tar extracted at 300°C under air

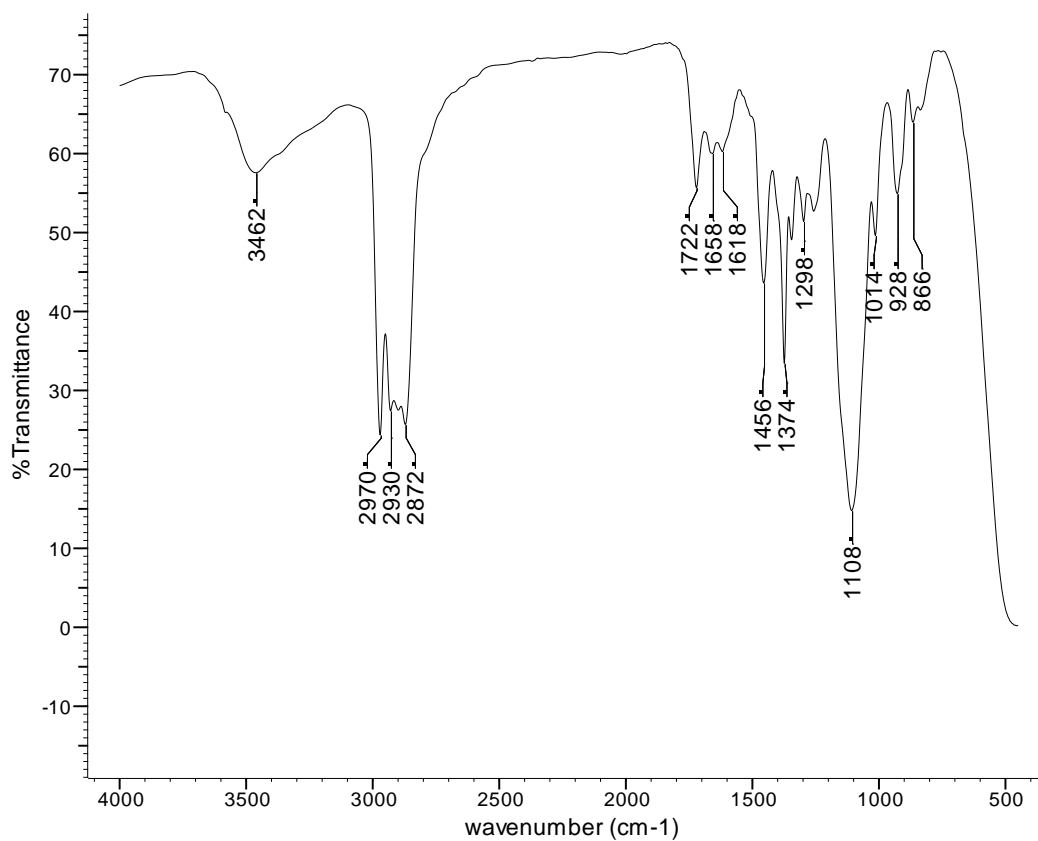


Figure 58: FTIR spectrum of the tar extracted at 350°C under air

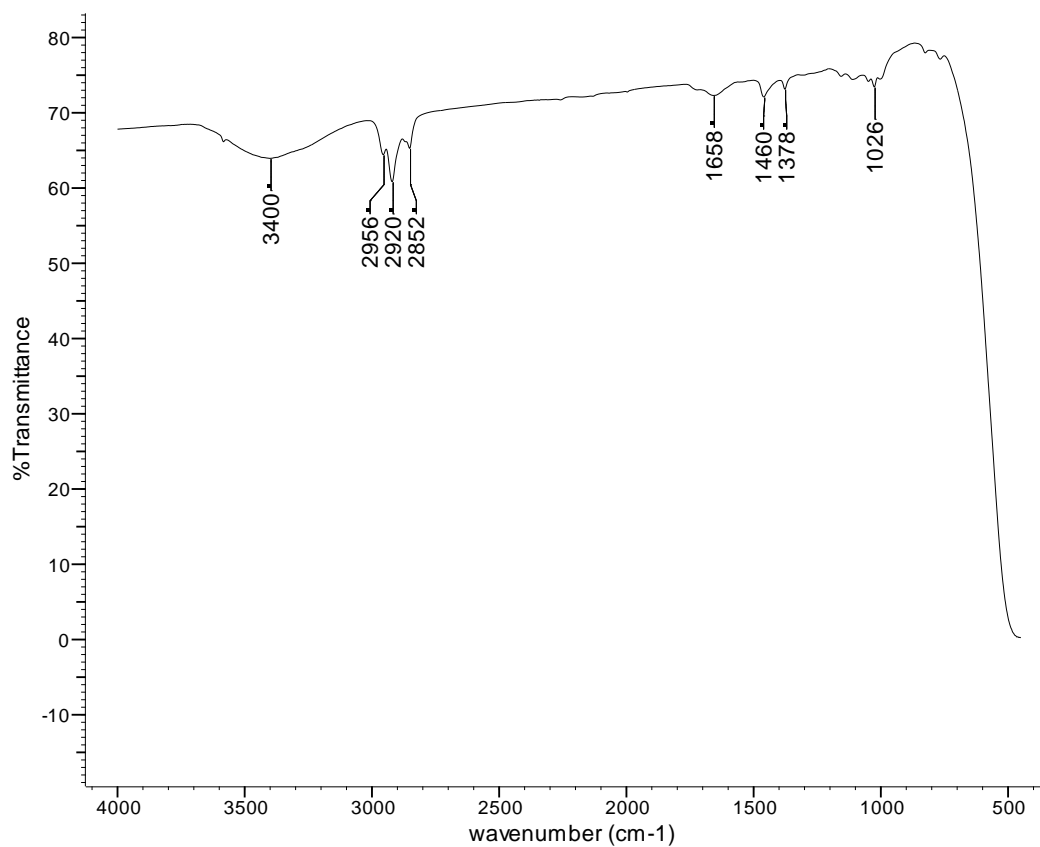


Figure 59: FTIR spectrum of the tar extracted at 400°C under air

1.4 Pyrolysis under 3% Oxygen in Nitrogen

1.4.1 Cold-ring fractions

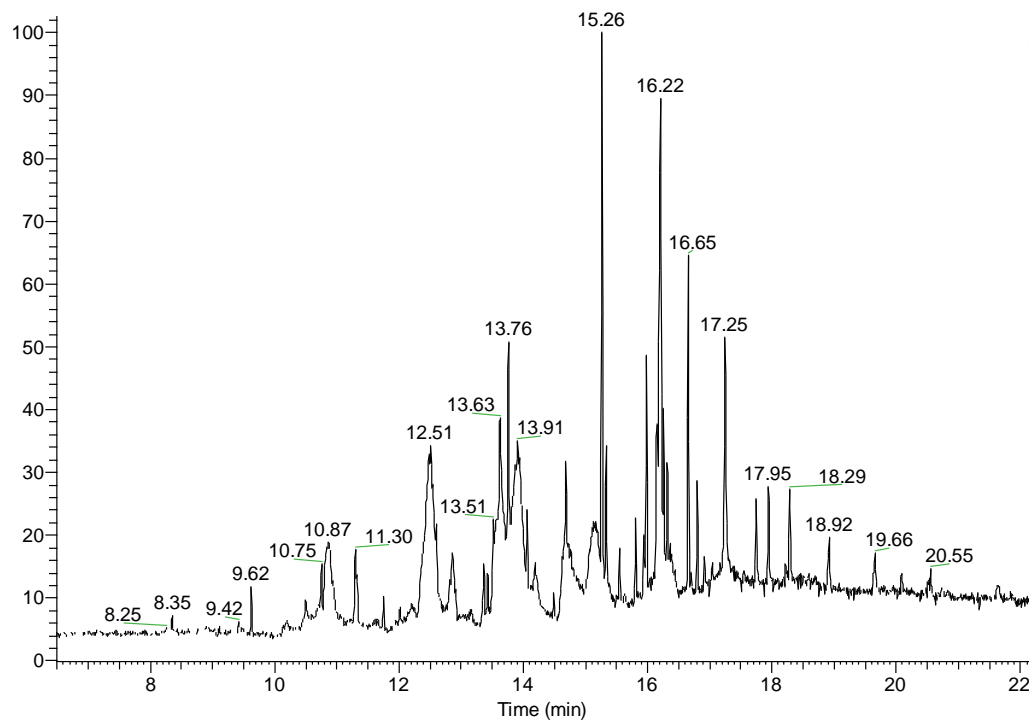


Figure 60: GC-MS chromatogram of the cold-ring fraction collected at 250°C under 3% O₂ in nitrogen

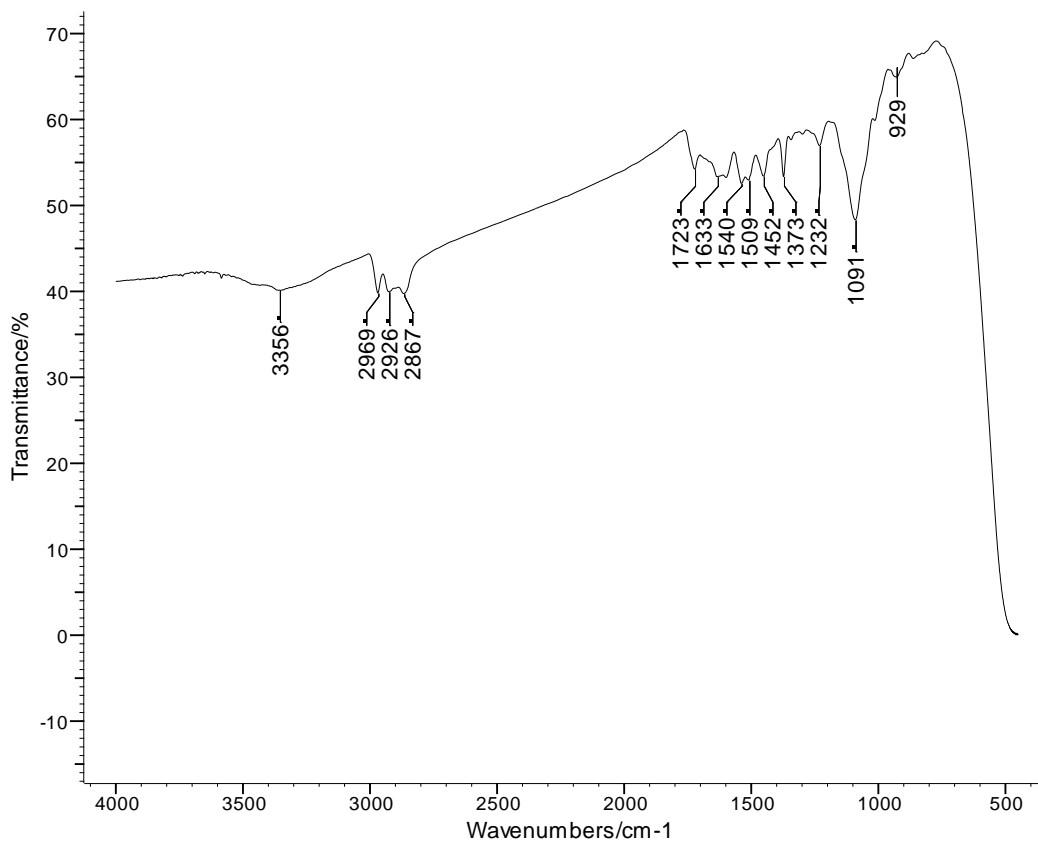


Figure 61: FTIR spectrum of the cold-ring fraction collected at 300°C under 3%O₂ in nitrogen

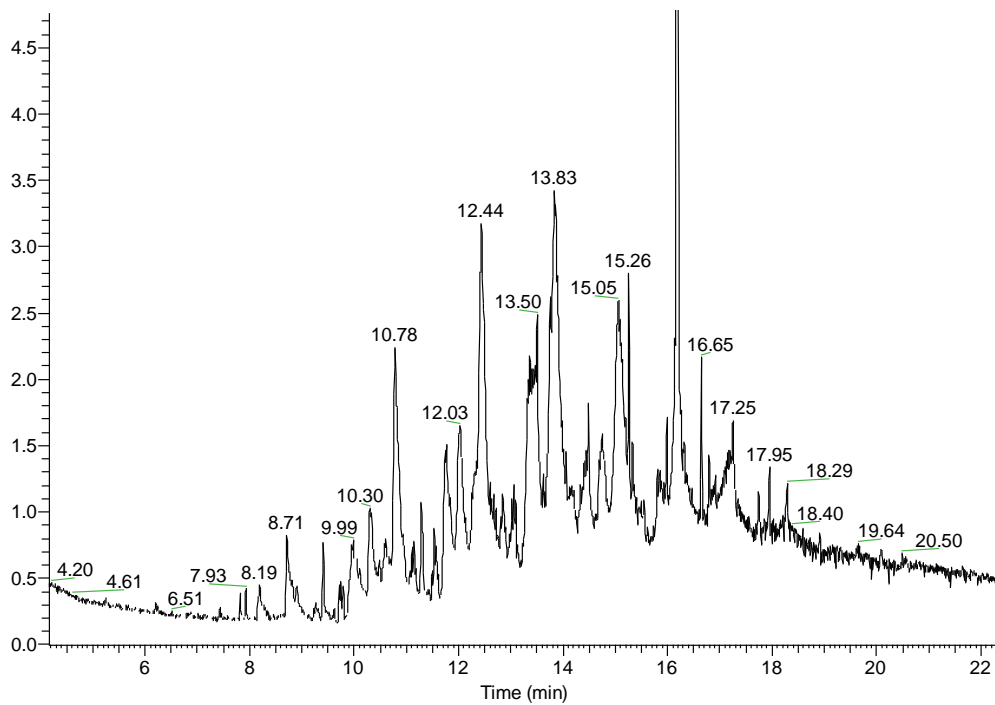


Figure 62: GC-MS chromatogram of the cold-ring fraction collected at 300°C under 3%O₂ in nitrogen

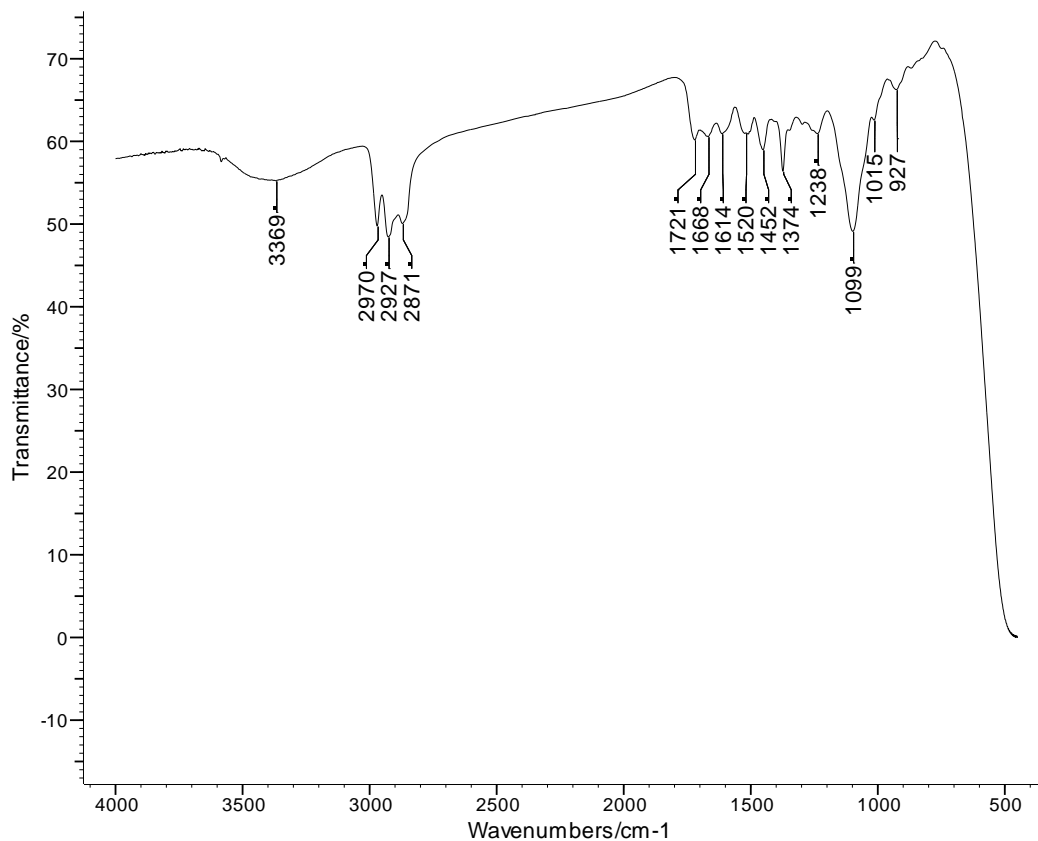


Figure 63: FTIR spectrum of the cold-ring fraction collected at 350°C under 3%O₂ in nitrogen

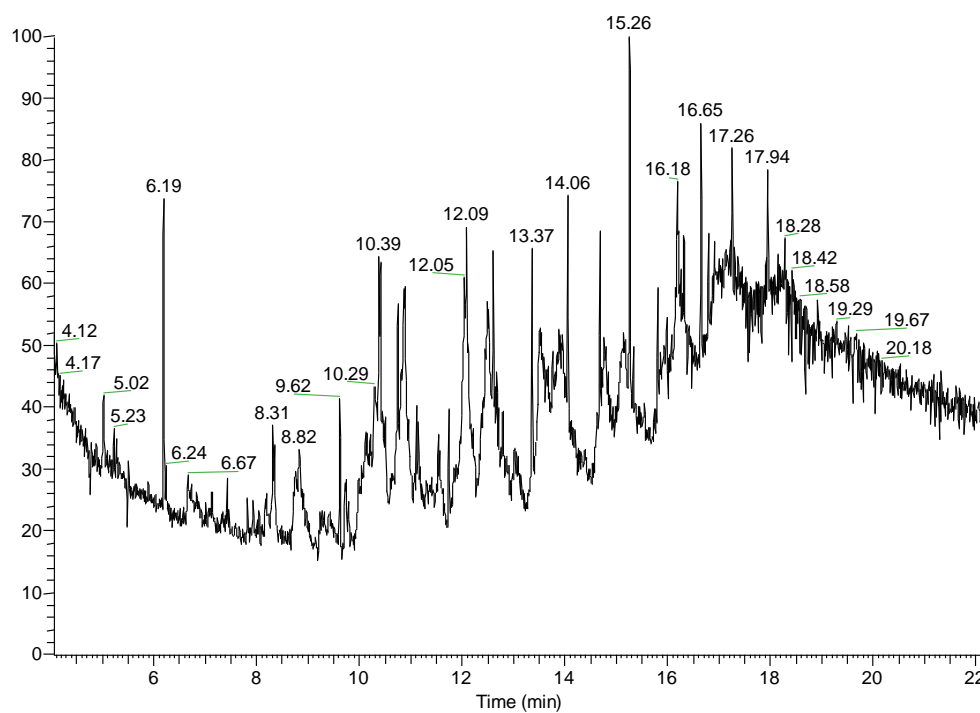


Figure 64: GC-MS chromatogram of the cold-ring fraction collected at 350°C under 3%O₂ in nitrogen

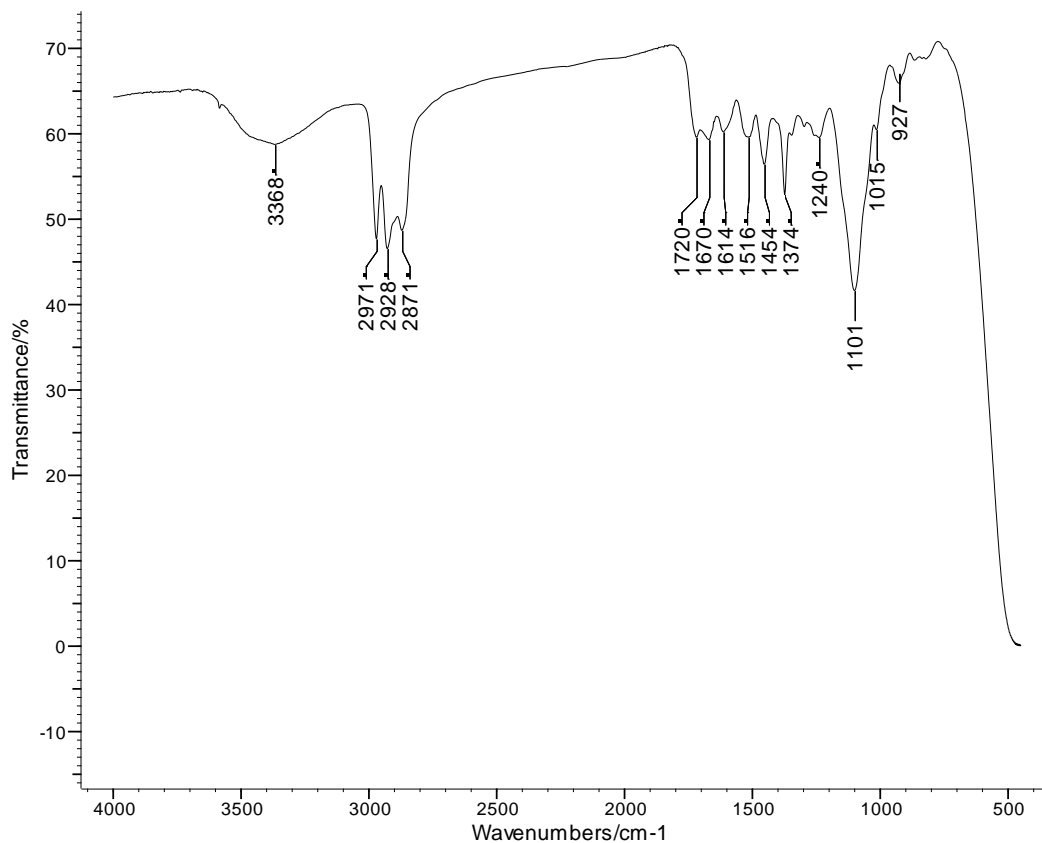


Figure 65: FTIR spectrum of the cold-ring fraction collected at 400°C under 3% O₂ under nitrogen

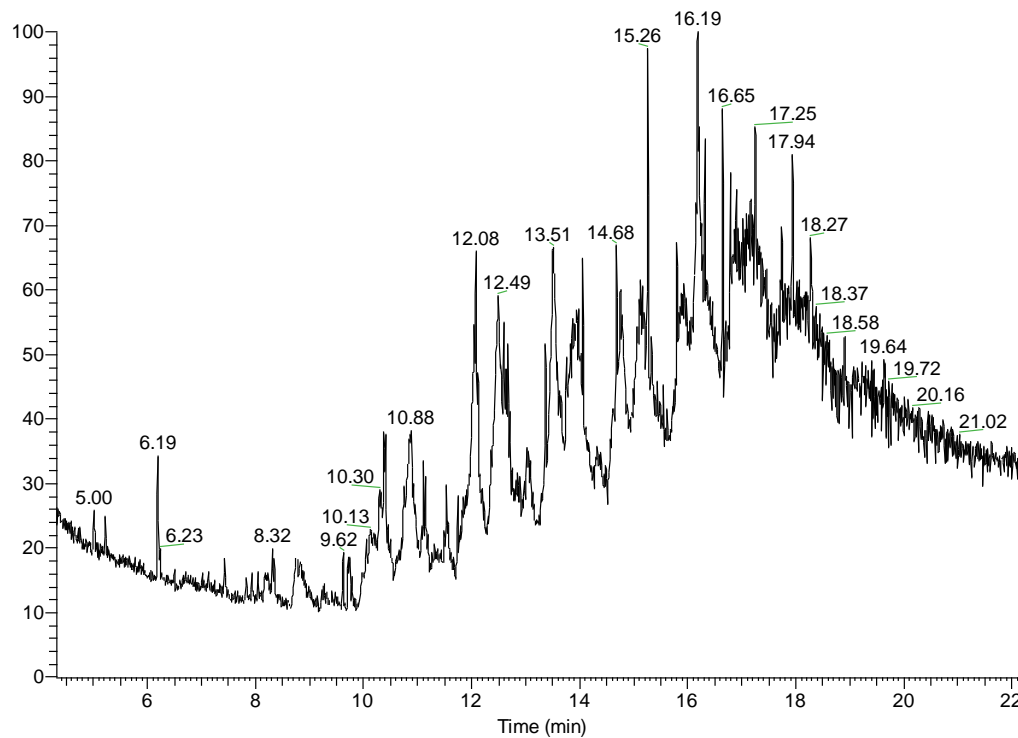


Figure 66: GC-MS chromatogram of the cold-ring fraction collected at 400°C under 3 % O₂ in nitrogen

1.4.2 Tars

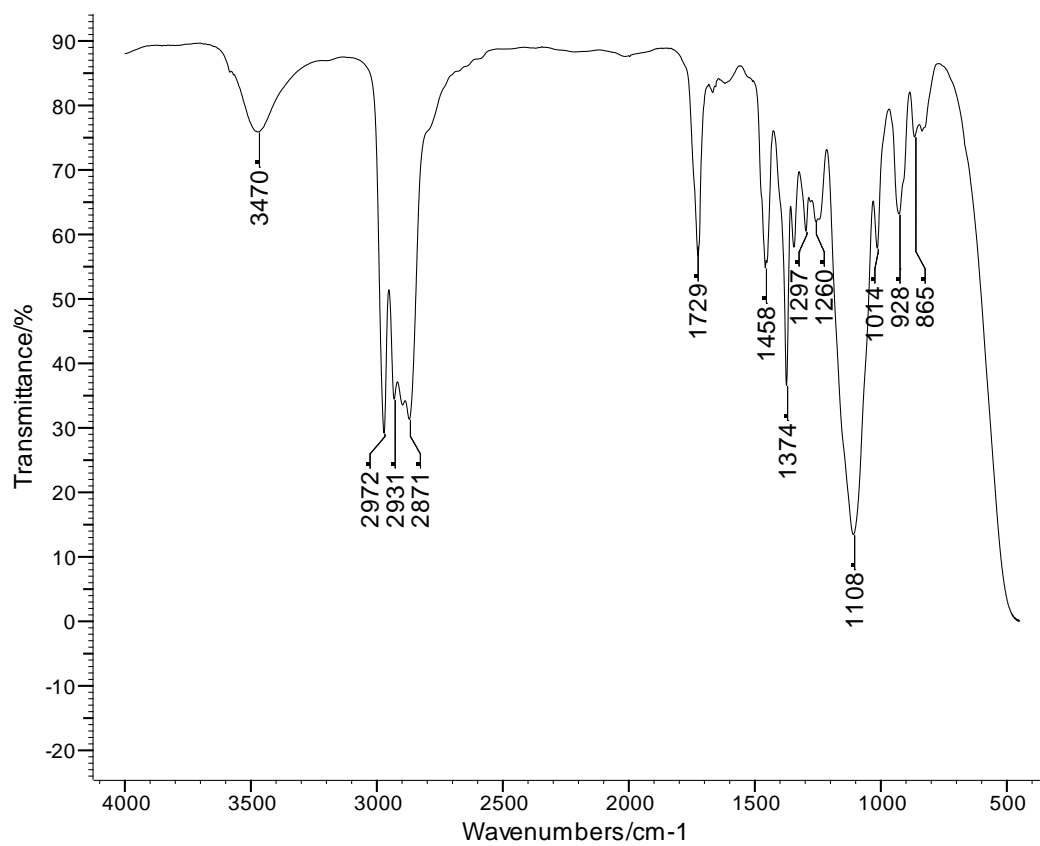


Figure 67: FTIR spectrum of the tar extracted at 300°C under 3%O₂ in nitrogen

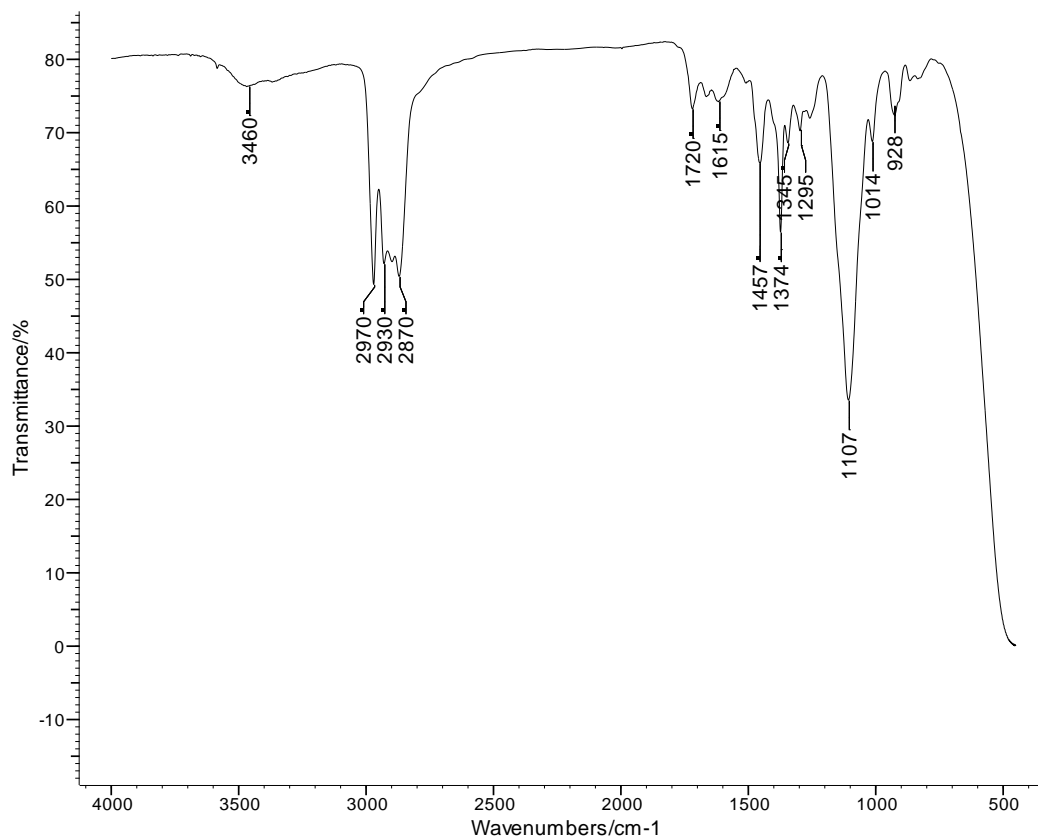


Figure 68: FTIR spectrum of the tar extracted at 350°C under 3%O₂ in nitrogen

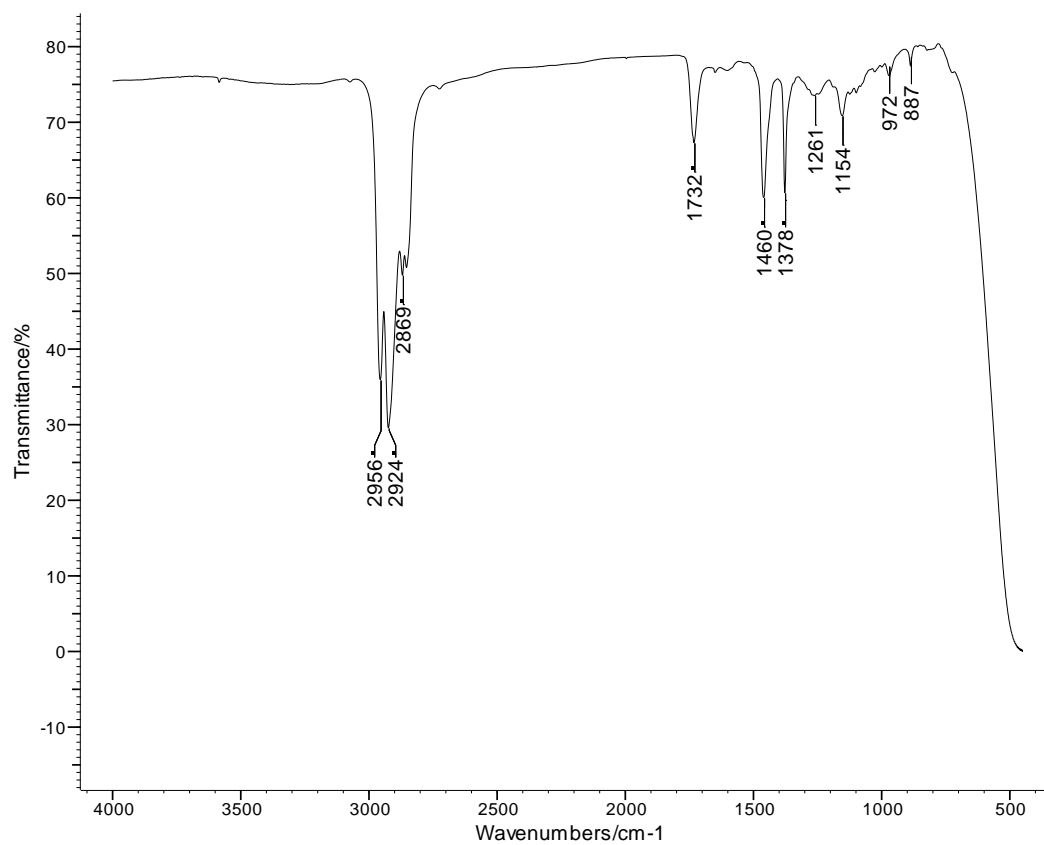


Figure 69: FTIR spectrum of the tar extracted at 400°C under 3%O₂ in nitrogen

1.4.3 ^{13}C Solid state NMR

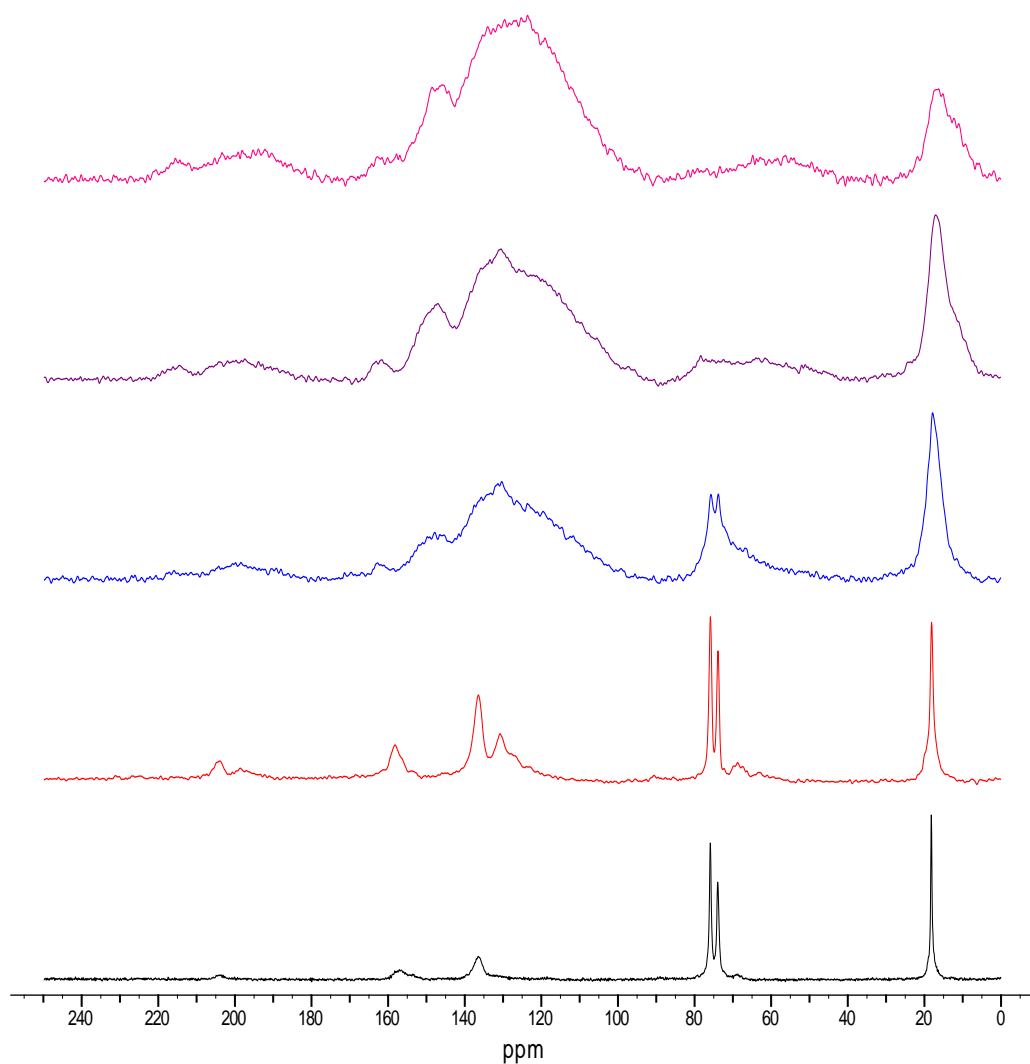


Figure 70: Comparison of the ^{13}C CPMAS dipolar dephased spectra of the virgin foam (black) with the chars obtained after pyrolysis under 3% oxygen in nitrogen at 250°C (red), 300°C (blue), 350°C (purple) and 400°C (pink)