

## Appendix C

### MID RANGE IR ASSIGNMENTS FOR POLYAMIDE TYPES STUDIED IN THE THESIS

Appendix C gives a table of FTIR spectroscopy peak frequencies in the mid infrared region for the four polyamides studied here. Results from the literature in differing crystallographic environments are provided along with the measured values from photoacoustic experiments on the polyamides with their morphology from formation in ampoules.

#### C.1 Mid range IR and hydrogen bond interactions

The table presented below is a compilation of assignments from various literature sources along with measured values of peak wavelengths found from ampoule samples of the polyamides and from some quenched samples also measured.

Table C-1 Assignments for polyamide bands **Bold**=[99, pp.85-88], *Italic* [48, p. 504]. Normal from ampoule samples and PA46 Gaymans are solution cast FTIR peaks from [122] in  $\text{cm}^{-1}$

<b>FTIR Assignment</b>	<b>PA46</b>	<b>PA46 Gaymans</b>	<b>PA46 Meas.</b>	<b>PA6 Amorph.</b>	<b>PA6 <math>\alpha</math> or <math>\beta</math></b>	<b>PA6 <math>\gamma</math></b>	<b>PA6 Meas.</b>	<b>PA69</b>	<b>PA69 Meas</b>	<b>PA612</b>	<b>PA612 Meas.</b>
Hydrogen bonded N-H stretch	3305	3300	3304		<i>3290</i>	<i>3290</i>	3302	3302	3302		3300
N-H band	3066	3070	3067		<i>3070</i>	<i>3090</i>	3069	3090	3090		3063
CH <sub>2</sub> asym stretch	2944	2945	2944		<i>2930</i>	<i>2930</i>	2935	2930	2930		2921
CH <sub>2</sub> sym stretch	2872	2870	2872		<i>2865</i>	<i>2860</i>	2868	2854	2854		2853
Amide I unassoc					<i>1667</i>	<i>1650</i>	1652		1652		1652
Amide I ordered					<i>1647</i>	<i>1643</i>	1647		1645		1645
Amide I	1652	1638	1652		<i>1642</i>	<i>1642</i>	1636	1636	1636		1634

FTIR Assignment	PA46	PA46 Gaymans	PA46 Meas.	PA6 Amorph.	PA6 $\alpha$ or $\beta$	PA6 $\gamma$	PA6 Meas.	PA69	PA69 Meas	PA612	PA612 Meas.
C=O stretch											
Amide II C-N stretch + C(O)-N-H bend	1540	1540			1545	1562	1559	1558	1558		
Amide II unassoc.				1560	1540	1560	1541				
									1541		1540
N vic, CH <sub>2</sub> bend ( $\alpha$ )	1476				1476		1476	1471	1471	1474	1474
CH <sub>2</sub> bend	1464		1459		1464	1463	1463	1466	1466	1467	
CH <sub>2</sub> bend	1438			1440	1436	1442	1437	1436	1436	1436	1438
CO vic, CH <sub>2</sub> bend ( $\alpha$ )	1418		1419		1417		1418	1420	1419	1419	1419
	1363		1363		1374	1369	1373	1371	1368	1369	1370
Amide III ( $\gamma$ )	1279	1280	1281	1281	1265	1269	1266		1277	1276	1277
								1249	1250	1237	1237
						1236	1242			1218	1217
( $\alpha$ )	1201		1200		1199		1201	1194	1196	1188	1188
( $\gamma$ ), amorph				1170	1170	1170	1170	1180	1189	1180	1188
Amorph	1140		1142	1124				1131	1126	1116	1116
						1121	1123	1111	1112		
					1060	1079	1071	1072	1072	1064	1064
			1027		1029	1048	1029	1026	1017	1036	1026
	984		989			1002		988	988	988	987
C-CO stretch $\alpha$ or $\gamma$					959	977	968				
C-CO stretch $\alpha$ or $\gamma$	944	940	943		930	922	929	940	942	937	938
	906		906					900	899	897	899

<b>FTIR Assignment</b>	<b>PA46</b>	<b>PA46 Gaymans</b>	<b>PA46 Meas.</b>	<b>PA6 Amorph.</b>	<b>PA6 <math>\alpha</math> or <math>\beta</math></b>	<b>PA6 <math>\gamma</math></b>	<b>PA6 Meas.</b>	<b>PA69</b>	<b>PA69 Meas</b>	<b>PA612</b>	<b>PA612 Meas.</b>
					<b>834</b>		833	<b>853</b>	842		853
						<b>777</b>		<b>797</b>	799	<b>791</b>	792
CH <sub>2</sub> wag	<b>733</b>	730	731		<b>731</b>	<b>730</b>	730	<b>727</b>	728	<b>731</b>	730
										<b>720</b>	721
Amide V ( $\gamma$ ) N-H out of plane						<b>712</b>					
Amide V ( $\alpha$ & $\beta$ )	<b>693</b>	690	692		<b>691</b>		691	<b>689</b>	695	<b>690</b>	692
Amide VI ( $\gamma$ ) C=O out of plane						<b>623</b>			627		612
Amide VI ( $\alpha$ )	<b>581</b>	575	581		<b>579</b>		579	<b>588</b>	574	<b>582</b>	582
Amide VI amorph				578					574		
	<b>524</b>	520	525		<b>522</b>	<b>521</b>	522	<b>532</b>	535	<b>539</b>	539