

Supplemental material to the article

From the capillar instability towards elastic instability of jet of polymer liquids: the role of interconnection network of macromolecules

Additional information

PAN polymer and copolymer samples characterized by the following parameters have been used

Polymer characterization^{*)}

Designation	AN, %	MA, %	IA/AA, %	M _n , kDa	M _w , kDa	MWD	[η], dl/g	k'
H1 ⁽⁶⁾	100	-	-/-	103.6	835.7	8.1	4.65	0.55
H2 ⁽²⁾	100	-	-/-	118.1	515.4	4.4	2.89	0.57
C3 ⁽²⁾	97	2	-/1	81.1	349.9	4.3	3.06	0.40
C4 ⁽²⁾	97	2	-/1	87.9	277.2	3.2	2.87	0.39
H5 ⁽²⁾	100	-	-/-	75.4	269.6	3.6	4.88	0.36
C6 ⁽²⁾	97	2	-/1	68.3	183.7	2.7	2.37	0.27
C7 ⁽³⁾	94	5	1/-	106.8	200.6	1.9	2.3	0.27
C8 ⁽³⁾	95.4	4	0.6/-	100.9	182.3	1.8	2.07	0.34
C9 ⁽³⁾	94.2	5	0.8/-	83.9	145.7	1.7	1.91	0.36
C10 ⁽⁵⁾	94	6	-/-	28.1	127.2	4.5	1.55	0.51
C11 ⁽⁴⁾	96	4	-/-	63.8	128.5	2.0	1.92	0.28
C12 ⁽²⁾	97	2	-/1	54.6	186.9	3.4	2.10	0.33
C13 ⁽²⁾	95.5	4	0.5/-	74.4	123.8	1.7	1.75	0.34
C14 ⁽²⁾	97	2	-/1	52.1	120.2	2.3	1.63	0.39
C15 ⁽²⁾	97	2	-/1	39.5	78.7	2.0	1.17	0.43
H16 ⁽²⁾	100	-	-	26.0	79.5	33.1	1.07	0.25
C17 ⁽¹⁾	95.5	4	0.5/-	32.3	54.1	1.7	0.92	0.28

^{*)}Designations: H – homopolymer, C – copolymer, MA – methacrylate, IA – itaconic acid, AA – acrylic acid; MWD – molecular-weight distribution. Number in brackets: 1 – synthesized by the pseudo-living polymerization method (M.V. Lomonosov Moscow State University, Prof. E.V. Chernikova), 2 – synthesized in the medium of supercritical CO₂ (M.V. Lomonosov Moscow State University, Prof. I.E. Nifantsev); 3 – synthesized in the sodium thiocyanate solution with subsequent fractionation (Saratov factory); 4 – synthesized in the sodium thiocyanate solution without fractionation (staple, Saratov factory); 5 – Exlan® PAN (Japan); 6 – (pilot production, Moscow).

Experiments have been carried out by the following protocol. A droplet of a solution ($\approx 50 \mu\text{l}$) was placed on the bottom of the lower cylinder. Then

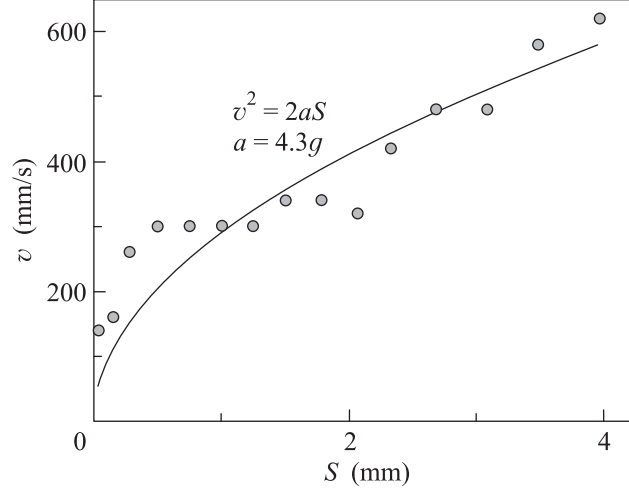


Figure 1: Figure Velocity profile at the movement of the carriage unit

the upper cylinder slowly moved down till the wetting with the solution droplet and held in this position during several seconds until the complete wetting and ceasing oscillations of the droplet clutched between the bases of the cylinders. Then the drive switched on.

The start of the movement and recording were synchronized. The carriage unit run the given distance and stopped by means of a limit switch. Velocity and acceleration of a carriage are determined by the current of a commutator motor. Varying the current of a motor, the convenient movement profile allowing us to follow the beginning of the fiber formation has been chosen. Such a velocity profile of the carriage movement as a function of the distance found from the sequence of frames is presented in Figure below. According to this velocity profile, the acceleration was equal to $a = 4.3g$ (where g is the gravitational acceleration). This mode of the jet extension was used in all experiments with polymer solutions: in all cases the carriage moved with zero initial velocity and the given acceleration.