Polymer lab essay

Materials and Manufacturing 2 Processing and testing of polypropylene Part A. Injection molding of polypropylene samples for mechanical testing. Introduction Injection molding is the most productive and popular polymer processing techniques. Almost 70% of all plastic parts are made using injection molding. Injection molding of plastics is a process similar to die casting of metals.

Molten polymer is injected under pressure into a mold. Method Put the plastic material (Polypropylene) in granular form into the hopper. Set the injection molding temperature: nozzle 1 240 °C, zone1 220 °C, zone 2 180 °C, zone 3 20 °C. Startup operations Press the red emergency stop button and release it by rotating in the direction of arrow. Open and close protective grating.

Put position selector on control panel into “ Manual operation” mode. Press the “ STOP” button on the control panel for a moment. Press “ START” button on the control panel. Put position selector on control panel into “ Semi automatic” mode. Close the mould by pushing “ CLOSE MOULD” button on the control panel. After each cycle open and close protective grating to make the next product.

Overall make 5 moldings of samples for tensile and impact testing. . Mechanical testing of polypropylene samples. Tensile testing of thermoplastics Standards: AS 1145 (Australian standard), ASTM D 638 (US standard) Testing equipment: Universal testing machine Zwick Z010; Electronic digital calliper Pro-max. Method: Measure and record the

dimensions of the cross sections of the test specimen; Clamp up specimen in the crossheads of machine and run the test.

Set distance between grips 100 mm Perform five tensile tests. Determine the mean and standard deviation of the samples tensile strength (maximum stress from stress-strain curve). Impact testing of thermoplastics. Standard ASTM D 256 (US standard), ISO 180 (International standard). Testing equipment: Impact tester CEAST Resil 25 Notch maker Electronic digital calliper Pro-max. Method: Measure and record the dimensions of the cross sections of the test specimen; Clamp up specimen in the vice jaws of the machine and run the test.

Perform five impact tests. TESTING OF PP: RESULTS Specimen number12345MeanS. D. Width (d), mm10. 210.

210. 210. 210. 210.

2- Thickness (b), mm2. 12. 02. 12. 12. 12.

10. 04 Maximum load, N3623643713723513647. 56Maximum stress, MPa16. 917. 817.

317. 416. 417. 20. 48 Table 1.

Measured, recorded and calculated results for tensile testing of PP. Specimen number12345MeanS. D. Impact Strength kJ/m^26. 838.

696. 8310. 746. 157. 851. 68 Table 2.

Measured, recorded and calculated results for impact testing of PP. Discussion: As you can see from the results obtained in the tensile testing of polypropylene and judging by the standard deviation of the values they all fell within the same vicinity of one another. The only exception being that the maximum load standard deviation was calculated to be 7. 6 which is rather off putting but this could down to the fact that we didn’t run the tensile test for very long (approximately only 30 seconds each run) and thus the test may be deemed as inaccurate. However, when determining the maximum stress, the standard deviation was only 0.

48 and this shows that the majority of the calculated stress values all fell within in the same region. This proves that the test was rather accurate as opposed to being inaccurate beforehand. Furthermore, the variation of values for the impact testing of polypropylene only strayed by 1. 68. This shows that the bulk of the values were around 6. 83-8.

69, with the outlier being the 10. 74 value. Different notch values can result in substantial differences in impact strength; the impact strength of 10. 74 kJ/m^2 proves this theory to feasible. Conclusion: After the completion of the practical, it is evident that the injection molding process is the most productive and popular polymer processing technique in the industry. It is a good indicator of the maximum stress and impact strength of polypropylene as proven by the minimal variation in the results.

Part B. Determination of polypropylene Melt Flow Index. Standards: ASTM D 1238 (US standard) Testing equipment: CEA7024F CEAST (Italy) Settings:

Temperature 230 °C, weight 2. 16 kg Method: Prepare 6 g of PP in granular form. Prepare the correct weight and place next to the instrument.

Insert the piston in the barrel for a few minutes (preheating). Press start on the main menu. Fill in the field operator your group number. Press start.

When the temperature is reached the set value insert material in the barrel and manually compact it using a provided tool. Insert the preheated piston. Preheat the material without weight till the acoustic signal. Manually place the test weight on the piston.

The instrument automatically begins measurements when the set position is reached. Cut the extruded filament at the end of the test. The instrument will guide the operator by emitting an acoustic signal at the beginning and at the end of each test. 1.

Measure weight of the extruded filament and insert data. Polypropylene MFI (MFR) Mean: 9. 985 [g/10min] Standard deviation: 0. 429 [g/10min] Discussion: Two tests were carried out for this particular experiment. The first method which were an estimate of the melt flow index of polypropylene gave an avg.

ass flow rate – 10. 654 [g/10min] and standard deviation – 0. 458. The second method which was the actual results gave an avg. MFR of 9.

985 and standard deviation – 0. 429. It can be clearly seen that there is not much difference in the two methods, therefore proving that this method is a feasible representation of the MFR of polypropylene. Conclusion: After completion of the experiment, it is evident that the standard deviation of

results only vary approximately 0. 5. For that reason, the analysis of the MFR of polypropylene is acceptable.