Synthesis and Characterization of Conducting Polymer - Poly-ortho Phenylene Diamine

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Abstracts

A polymer is a large molecule built up by the repetition of small simple chemical unit. in some cases the repetition is linear, much as a chain is built up from its links. in other cases the chains are branched or interconnected to form two dimensional or three dimensional networks. poly-ortho phenylene diamine is synthesized by redox reaction with ortho phenylene diamine and the reagent ammonium peroxydisulphate $(NH_4)_2S_2O_8$. The characterization is done with I.R. spectra and thermogravimetric analysis (TGA), after pelletisation the conductivity measurements done. Surprisingly there is no any response from the instrument towards the pellet.

Key words: Ortho phenylene diamine(OPDA), Polymer, poly-Ortho phenylene diamine, Pellatization, Redox reaction.

Introduction

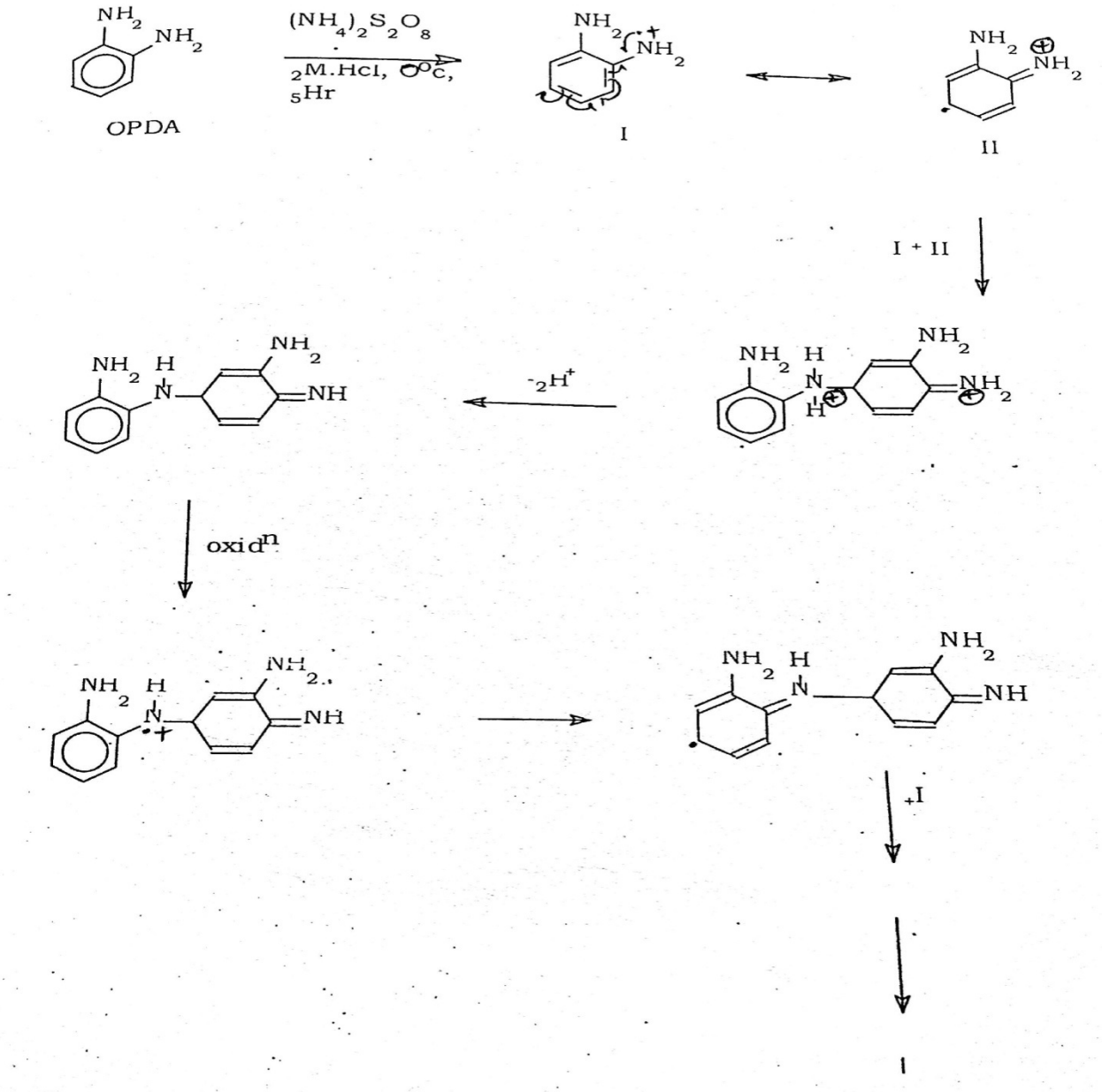
The word polymer means many (poly) units (mer), one connected to each other. A simple molecule that is a chemical unit is repeated in a very large number of times in the structure of a polymeric molecule. Polymers are common in day to day life that is plastics being somehow the opposite of metals, they insulate, do not conduct electricity. Electric wires one that coated with polymer to protect them and save us from short circuits. It is possible to have conductivity of polymer just like metals. now scientists have changed this view with their discovery that a conductive polymer which can be conductive almost like a metal. Electrical conductivity is not a property frequently associated with organic compounds consequently electrically conductive polymers originally attracted attention simply because they were unusual.

Methods and Materials

Prepared a Clear solution of OPDA (2 gm) in distilled water and kept it on magnetic stirrer then added ammonium peroxydisulphate $(NH_4)_2S_2O_8$ (6gm) with stirring. Then added 2M HC l(1.6 ml HCL in 10 ml water) in portions for 3 hours and continued stirring for more 2 hours. After sufficient time a brown color ppt is obtained, Filtered ppt and washed with water and then MeOH, so as to remove oligomeric impurities. The obtained brown ppt cake is dried and then grind in mortar to get fine polymer powder. The polymerization of OPDA to poly-OPDA proceeds through formation of radical cation initiated by chemical oxidation.

Characterization of polymer powder is done with U.V., I. R. spectroscopy (fig.2) and Thermogravimetric analysis (Table.1) pelletisation is done with hydraulic pressure instrument circular dye with the diameter of 1cm. The conductivity measurements done with four probe method, this method measures the resistance. Surprisingly there is no any response from the instrument towards the pellet .

Mechanism



Structure of poly ortho phenylene diamine

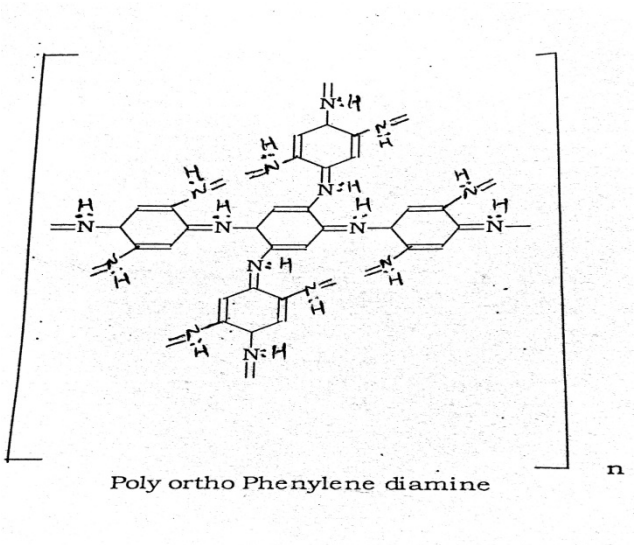
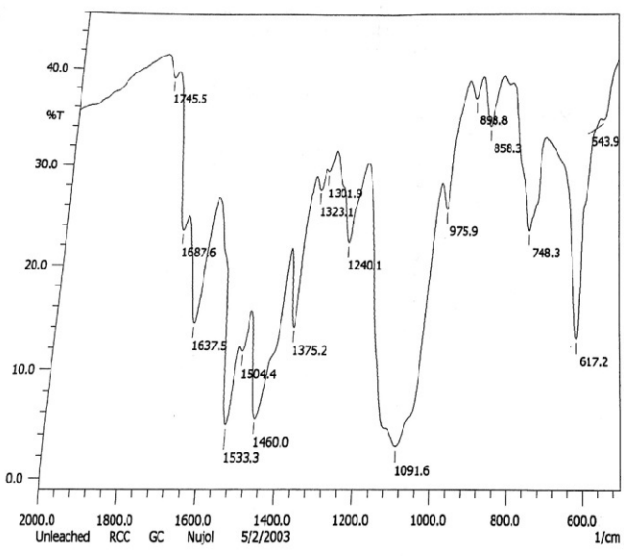


Fig 1. Structure



Peaktable of RCUL.IRS, 17 Peaks
Threshhold: 50, Noise: 0.5, File Range Selection

No. (%T)	Pos. (1/cm)	Inten.
1	543.9	35.192
2	617.2	13.219
3	748.3	23.966
4	858.3	34.435
5	898.8	37.248
6	975.9	26.098
7	1091.6	2.931
8	1240.1	22.542
9	1301.9	29.727
10	1323.1	27.861
11	1375.2	14.123
12	1460.0	5.472
13	1504.4	11.793
14	1533.3	4.841
15	1637.5	14.451
16	1687.6	23.559
17	1745.5	39.210

I.R. Spectra: Fig2.

Thermogravimetric Analysis:

Wt of tube:- 3.6797 g **R.T**.:- 26^{0}C

Wt of Tube + powder: - 3.7349 g **Wt of powder**: - 0.0552 g

Table-1

Sr. No.	Temp (^{o}c)	Wt. Loss(g)	Sr. No.	Temp (^{o}c)	Wt. Loss(g)
1	30	3.7349	29	170	3.7295
2	35	3.7349	30	175	3.7295
3	40	3.7349	31	180	3.7294
4	45	3.7349	32	185	3.7294
5	50	3.7349	33	190	3.7292
6	55	3.7349	34	195	3.7292
7	60	3.7343	35	200	3.7292
8	65	3.7338	36	205	3.7283
9	70	3.7331	37	210	3.7270
10	75	3.7331	38	215	3.7269
11	80	3.7325	39	220	3.7269
12	85	3.7320	40	225	3.7269
13	90	3.7318	41	230	3.7269
14	95	3.7318	42	235	3.7264
15	100	3.7315	43	240	3.7263
16	105	3.7315	44	245	3.7258
17	110	3.7311	45	250	3.7257
18	115	3.7308	46	255	3.7252
19	120	3.7302	47	260	3.7252
20	125	3.7302	48	265	3.7246
21	130	3.7302	49	270	3.7237
22	135	3.7300	50	275	3.7220
23	140	3.7300	51	280	3.7209
24	145	3.7299	52	285	3.7208
25	150	3.7297	53	290	3.7200
26	155	3.7297	54	295	3.7200
27	160	3.7297	55	300	3.7192
28	165	3.7297	56	305	3.7192

Result and Discussion

The brown colored ppt of poly-OPDA is obtained. The U.V. analysis of the same showed a band above 200 nm it means their is a conjugated system. (Fig.1) The I.R. analysis shows a peak at 1637.5 cm^{-1} is due to aromatic ring. 1460, 1533 cm^{-1} peaks are due to N-quinoid ring. As there are no peaks at 3300-3350 cm^{-1} it means their is no any -NH_2 group present in the polymer. This shows that all -NH_2 of OPDA are used for polymerization.(fig.2)

In thermogravimetric analysis the loss in weight of polymer powder decrease with increase in temperature or remains constant. this indicates that the polymer powder is thermally stable. (Table.1) After pelletisation the conductivity measurements done with four probe method, this method measures the resistance. Surprisingly there is no any response from the instrument towards the pellet .

References

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