Data in brief 29 (2020) 105161

Contents lists available at ScienceDirect

Data in brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Dataset for synthesis of conducting polymers nanocomposites based on aniline and 4-amino-benzylamine catalyzed by chromium (III) exchanged maghnite (Algerian MMT) via in situ polymerization

Fatima Zohra Zeggai [a, b], Mohammed Belbachir [b], Benjamin Carbonnier [c], Abdelkader Rahmouni [b, *], Bachari Kaldoun [a]

[a] Centre de Recherche Scientifique et Technique en Analyses Physico-chimiques (CRAPC), BP 38Bou-Ismail-RP, 42004, Tipaza, Algeria
[b] Polymer Chemistry Laboratory, Oran1 University Ahmed Benbella, BP 1524, El'Menouer, 31000, Oran, Algeria
[c] Paris-Est University, UMR 7182. 2-8, F-94320, Thiais, France

ARTICLE INFO

Article history:
Received 23 October 2019
Received in revised form 13 January 2020
Accepted 14 January 2020
Available online 23 January 2020

Keywords:
Polyaniline
Nanocomposites
In situ polymerization
Poly (4-aminobenzylamine)
Montmorillonite clay

ABSTRACT

In this data we report on conductors polymers nanocomposites synthesized by in situ polymerization of aniline (ANI) and/or 4-aminobenzylamine (4-ABA) in presence of chromium montmorillonite (MMT-Cr^{+3}) and ammonium persulfate as oxidizing agent. Homopolymers and copolymers (PANI-co-4-ABA) were prepared at various initial monomer composition and were characterized by Fourier transform Infrared (FT-IR) and UV–vis spectroscopy, X-ray diffraction (XRD) and cyclic voltammeter. The data describes the behavior of the corresponding homopolymers Poly (4-ABA) and (PANI) and showed that the in-situ polymerization produced real nanocomposites containing aniline and 4-aminobenzylamine units and films of products exhibit good electrochemical properties.

* Corresponding author.
E-mail address: ramaek23@yahoo.fr (A. Rahmouni).

https://doi.org/10.1016/j.dib.2020.105161

Specifications Table

Subject	Polymer chemistry
Specific subject area	Synthesis and characterization of nanocomposites catalyzed by maghnite-H+(Algerian MMT) via in situ polymerization
Type of data	Table, Image and Figure
How data were acquired	SEM, NMR, FTIR, XRD,TGA,UV, Cyclic Voltammogram
Data format	Raw and analyzed
Experimental factors	Synthesis and characterization of new nanocomposites under effect of heterogeneous catalyst called maghnite-H+ (Algerian MMT) exchanged with chromium (III) via in situ polymerization. The obtained nanocomposite was characterized and discussed by several methods such as (XRD, FTIR, Electrical and electrochemical conductivity, SEM, HNMR).
Experimental features	Maghnite (Algerian MMT) was used as heterogeneous catalyst for synthesis of organic and polymeric materials.
Data source location	Republic algerian democratic and popular
Data accessibility	Data are supplied with this article
Related research article	A. Rahmouni and M. Belbachir. Molecular structure of PANI and its homologue PANI−PEO_{2000} catalyzed by Maghnite-H+ (Algerian MMT): Synthesis, characterization and physical and chemical properties. Polymer Bulletin (2019) 76:4677−4701.https://doi.org/10.1007/s00289-018-2620-7.

Value of the Data

- The data in this article will be informative to synthesis of polymeric materials under effect of heterogeneous catalyst called maghnite (Algerian MMT).
- By using these data, researchers can make comparisons with other polymerization like (cationic polymerization, anionic polymerization, radical polymerization, polymerization by emulsion …..) and comparisons between (homogenous catalyst and heterogeneous catalyst).
- Strategy for this method of synthesis employed in this Data article can be used as a reference for future studies in the electronic domain.
- The Data obtained in this work can be effectively applied for the synthesis of conductor polymers nanocomposites under effect of heterogeneous catalyst (Algerian-MMT) via in situ polymerization.
- The data can be highlighted for further studies in development of better strategy for synthesis of conducting polymer especially for electronic and electrical domain.

1. Data

The data described in this paper provides formation of nanocomposite structures used in electronic domain catalyzed by maghnite-Cr^{3+}. PANI/MMT-Cr^{3+}, Poly (4-ABA/MMT-Cr^{3+}) and Poly (ANI-co-4-ABA)/MMT-Cr^{3+} nanocomposites were successfully synthesized under effect of modified

Table 1
Elementary compositions wt. % of chromium (Cr^{3+}) and sodium (Na^{+}) exchanged sample raw-maghnite (Algerian MMT).

Compositions wt.%	SiO_2	Al_2O_3	Fe_2O_3	CaO	Na_2O	MgO	K_2O	TiO_2	Cr_2O_3	Pert in fire
Raw-MMT	69.39	14.67	1.16	0.30	0.50	1.07	0.79	0.16	0.00	11.96
MMT-Na	70.75	14.46	1.05	0.19	2.61	1.01	0.78	0.14	0.00	09.01
MMT-Cr	71.01	14.06	1.00	0.14	0.15	0.98	0.71	0.15	2.61	09.35

Table 2
Peak maximum and d-spacing of protonated and the nanocomposites intercalated into sodium montmorillonite.

Samples	Peak maximum	Basal spacing	Interlayer spacing
	2θ max (deg)	$d_{(001)}$ (A°)	Δd (A°)
MMT-Na	6.96	12.94	–
MMT-Cr	6.06	14.67	1.73
P(4aba_co-ani)/MMT-Cr (20/80)	5.65	15.63	2.69
P(4aba_co-ani)/MMT-Cr (80/20)	5.52	16.04	3.1
P(4aba_co-ani)/MMT-Cr (50/50)	5.64	15.71	2.77
P4ABA/MMT-Cr	5.56	15.88	2.94
PANI/MMT-Cr	5.64	15.71	2.77

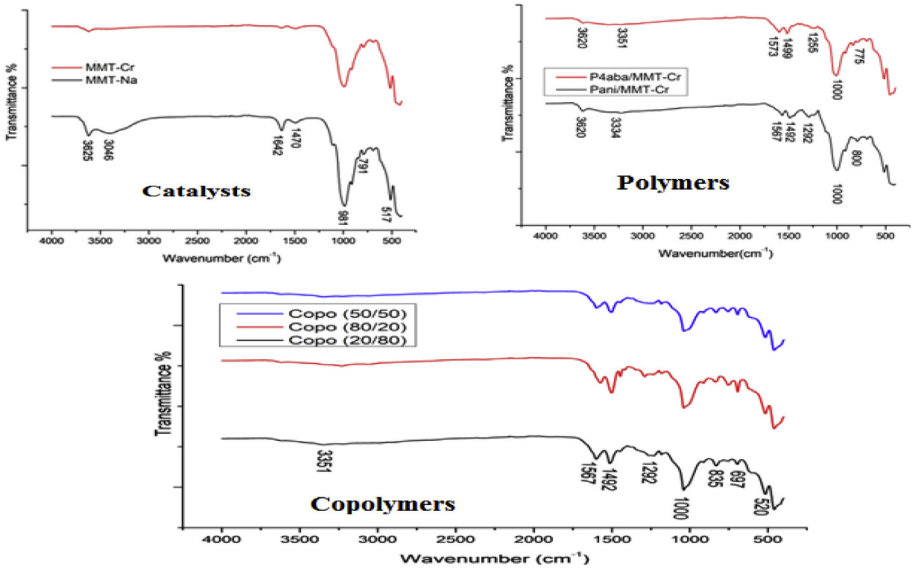

Fig. 1. FT IR-spectra of the MMT-Na, MMT-Cr and the nanocomposites poly (4-ABA/MMT-Cr), PANI/MMT-Cr and their copolymers Poly (4-ABA-co-ANI/MMT-Cr).

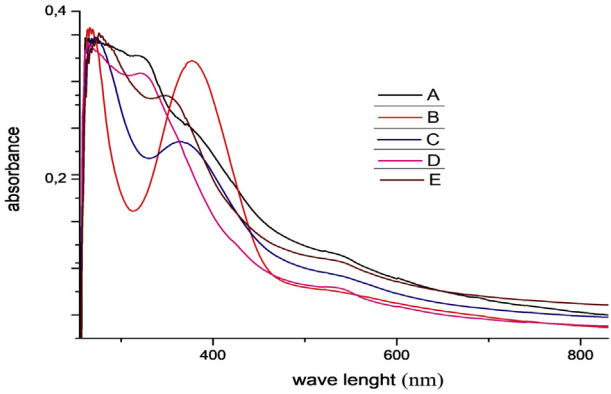

Fig. 2. UV–Vis spectra of the homo and copolymer nanocomposites doped with MMT-Cr, A: Poly (4-ABA/MMT-Cr), B: Poly (ANI/MMT-Cr), C: Poly (4-ABA-co-ANI)/MMT-Cr; 80/20, D: Poly (4-ABA-co-ANI)/MMT-Cr; 20/80, E: Poly (4ABA-co-ANI)/MMT-Cr; 50/50).

clay layered called maghnite-Cr^{3+} (Algerian MMT-Cr^{3+}) by in situ polymerization route in the presence of oxidizing agent. The formation of polymers and copolymers was confirmed by FTIR, XRD, 1HNMR, ATG, electrical conductivity and Uv–Visible measurements [1,2]. Table 1 describes elementary compositions wt. % of chromium (Cr^{3+}) and sodium (Na^{+}) exchanged sample raw-maghnite (Algerian MMT). Table 2 describes Peak maximum and d-spacing of protonated and the nanocomposites intercalated into sodium montmorillonite. Fig. 1 FT IR-spectra of the MMT-Na, MMT-Cr and the nanocomposites poly (4-ABA/MMT-Cr), PANI/MMT-Cr and their copolymers Poly

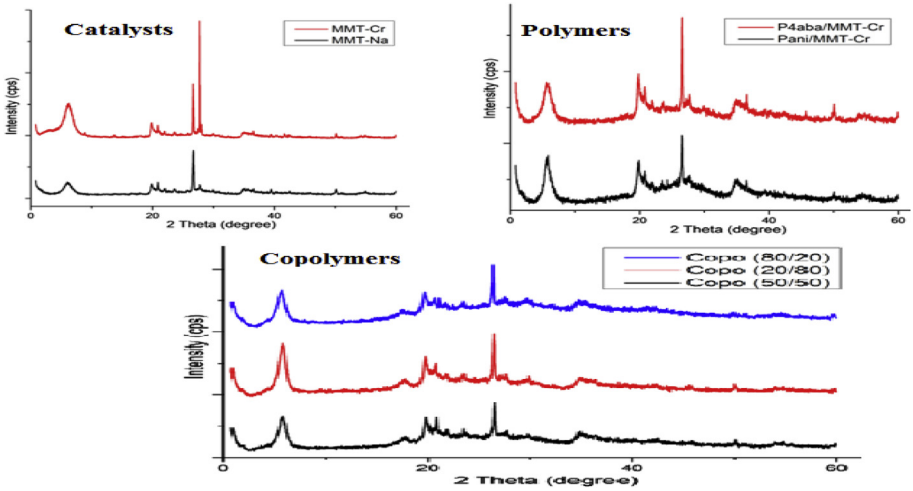

Fig. 3. X-ray diffraction patterns of two montmorillonite (MMT-Na and MMT-Cr), and the nanocomposites (PANI/MMT-Cr, Poly (ani-co-4aba)/MMT-Cr, P4ABA/MMT-Cr).

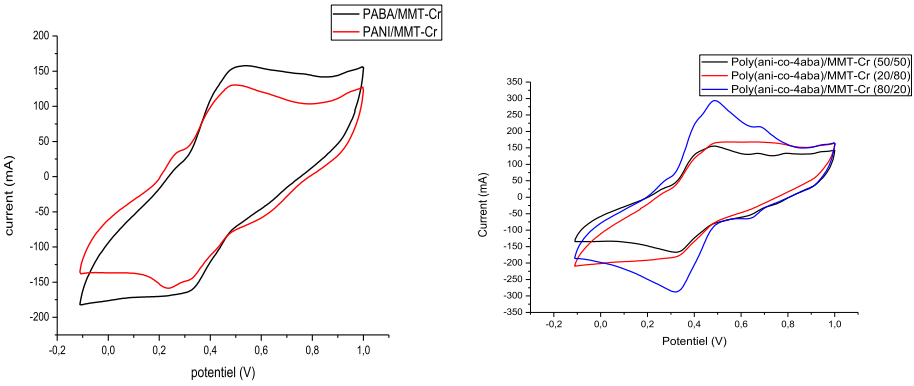

Fig. 4. Cyclic voltammogram recorded of polymer and copolymer films formed in 1.0 M $HClO_4$ on graphite carbon electrode.

(4-ABA-co-ANI/MMT-Cr^{3+}). Fig. 2 describes UV–Vis spectra of the homo and copolymers nanocomposites doped with MMT-Cr^{3+}, A: Poly (4-ABA/MMT-Cr), B: Poly (ANI/MMT-Cr), C: Poly (4-ABA-co-ANI)/MMT-Cr^{3+}: 80/20, D: Poly (4-ABA-co-ANI)/MMT-Cr^{3+}: 20/80, E: Poly (4ABA-co-ANI)/MMT-Cr^{3+}: 50/50). Fig. 3 describes X-ray diffraction patterns of two montmorillonite (MMT-Na and MMT-Cr), and the nanocomposites (PANI/MMT-Cr, Poly (ani-co-4aba)/MMT-Cr, P4ABA/MMT-Cr). Fig. 4 describes cyclic voltammogram recorded of polymer and copolymer films formed in 1.0 M $HClO_4$ on graphite carbon electrode. Fig. 5 describes TGA curves of PANI prepared in the presence of Maghnite-H^+ (0.25 M). Fig. 6 describes TGA curves of Poly (4-ABA-co-ANI/MMT-Cr) synthesized in the presence of Maghnite-H^+ (0.25 M). Fig. 7 describes ^{1}H-NMR spectra of (PANI) obtained by the intercaled method between Aniline and Maghnite-Cr^{3+} (black powder).

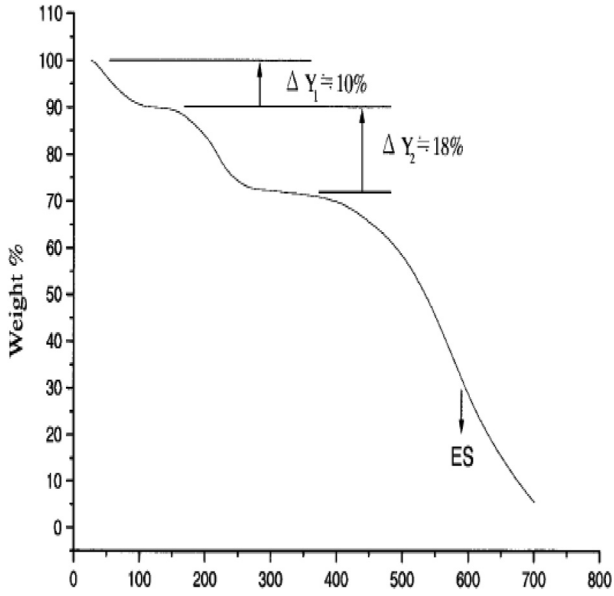

Fig. 5. TGA curves of PANI prepared in the presence of Maghnite-H+ (0.25 M).

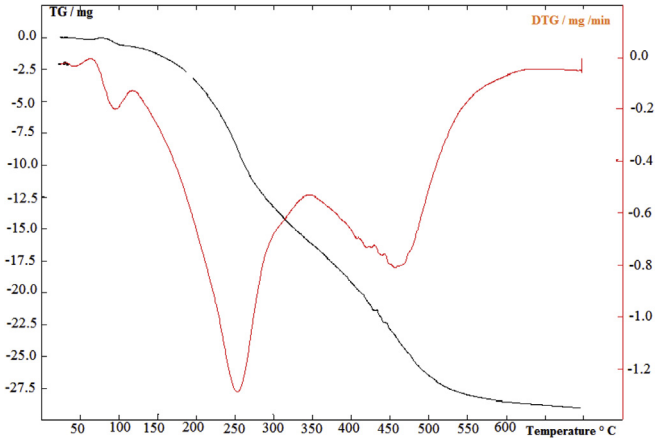

Fig. 6. TGA curves of Poly (4-ABA-co-ANI/MMT-Cr) prepared in the presence of Maghnite-H+ (0.25 M).

Fig. 8 describes ^{1}H-NMR spectra of the block copolymer poly (aniline)-b-poly (4-aminobenzylamine) catalyzed by Maghnite-Cr^{3+} by in situ polymerization. Fig. 9 describe proposed mechanism of homopolymer (PANI) catalyzed by Maghnite-H^{+} by in situ polymerization. Fig. 10 describe proposed mechanism of homopolymer poly (4-aminobenzylamine) catalyzed by Maghnite-H+ by in situ polymerization. Fig. 11 describe proposed mechanism block copolymer poly (aniline)-b-poly (4-aminobenzylamine).

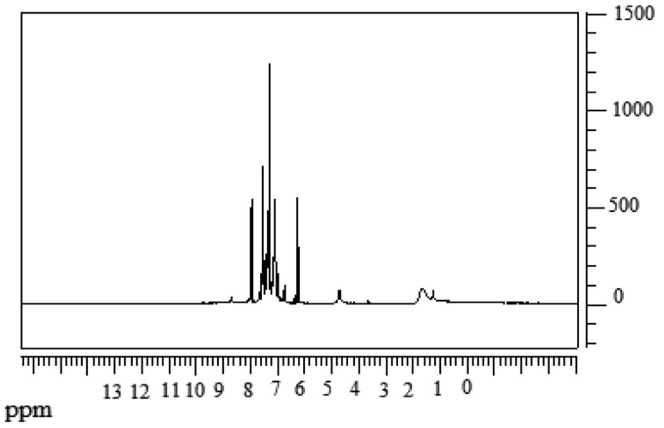

Fig. 7. [1]H-NMR spectra of (PANI) obtained by the intercaled method between Aniline and Maghnite-Cr3+ (black powder).

2. Experimental design, materials, and methods

2.1. Preparation of Maghnite-Cr^{+3} (MMT-Cr^{+3})

The raw-clay sample (Raw-MMT) was washed with distilled water to remove impurity [3,4]. The obtained montmorillonite (10 g) was crushed for 20 min using a Prolabo ceramic balls grinder. The greatest proton saturation of the <2 mm fractions of clay were obtained by first saturating with Na + ions using 1 M NaCl solution and to confirm the absence of chloride we use the silver nitrate

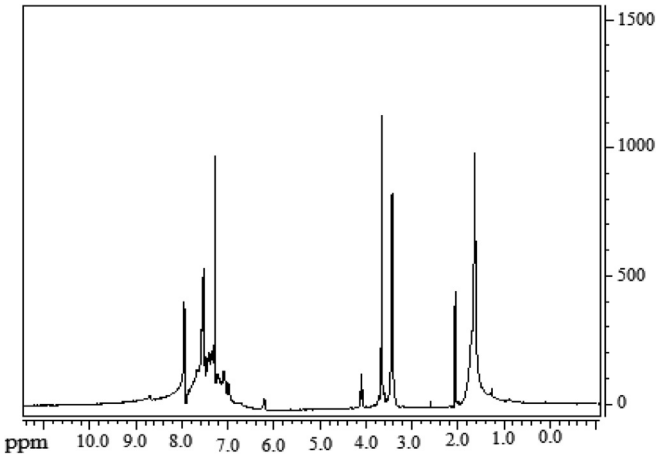

Fig. 8. [1]H-NMR spectra of the block copolymer poly (aniline)-b-poly (4-aminobenzylamine) catalyzed by Maghnite-Cr3+ by in situ polymerization.

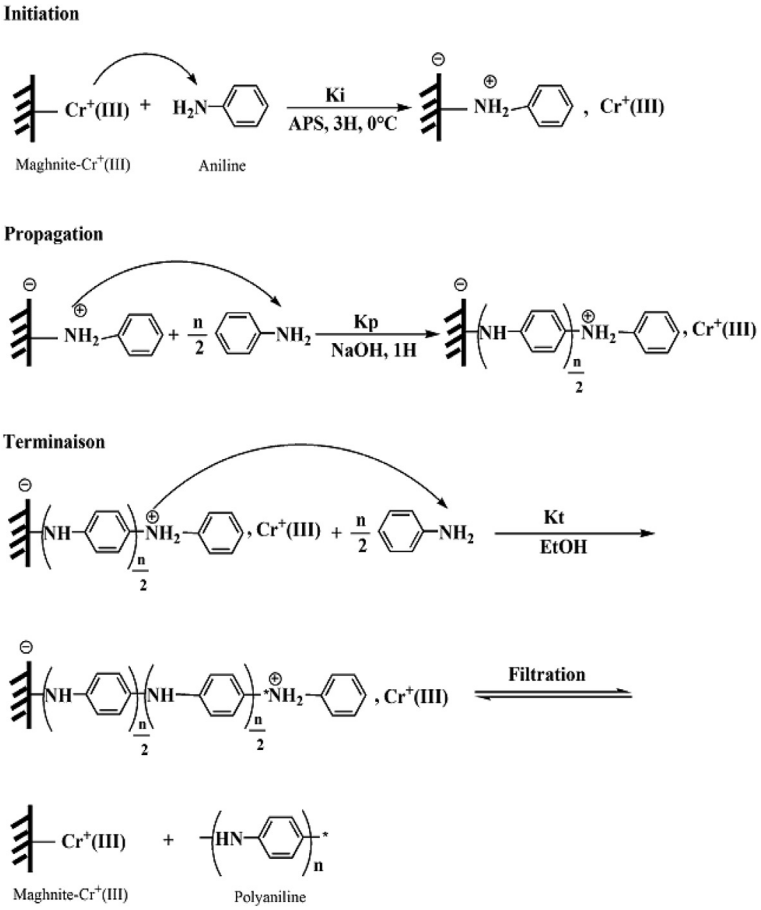

Fig. 9. Proposed mechanism of homopolymer (PANI) catalyzed by Maghnite-H+ by in situ polymerization.

[5,6]. To obtain MMT-Na+ with chromium intercalated (MMT-Cr^{+3}), the MMT-Na+ was dispersed into a 1 M $CrNO_3$ solution and stirred for 24 h and then the solid was recovered by centrifugation and washed with abundant water [7,8]. The catalyst composition was determined by X-ray fluorescence, the obtaining data are listed in Table 1 [9,10].

2.2. Synthesis of polymers/Maghnite-Cr^{+3}

Polymer/MMT-Cr^{+3} nanocomposites have been prepared by In-Situ process and the synthesis procedure is briefly described as follows:

The monomers were added by various feed mole fractions. In all cases, the mole ratio of oxidant to the total monomer was defined.

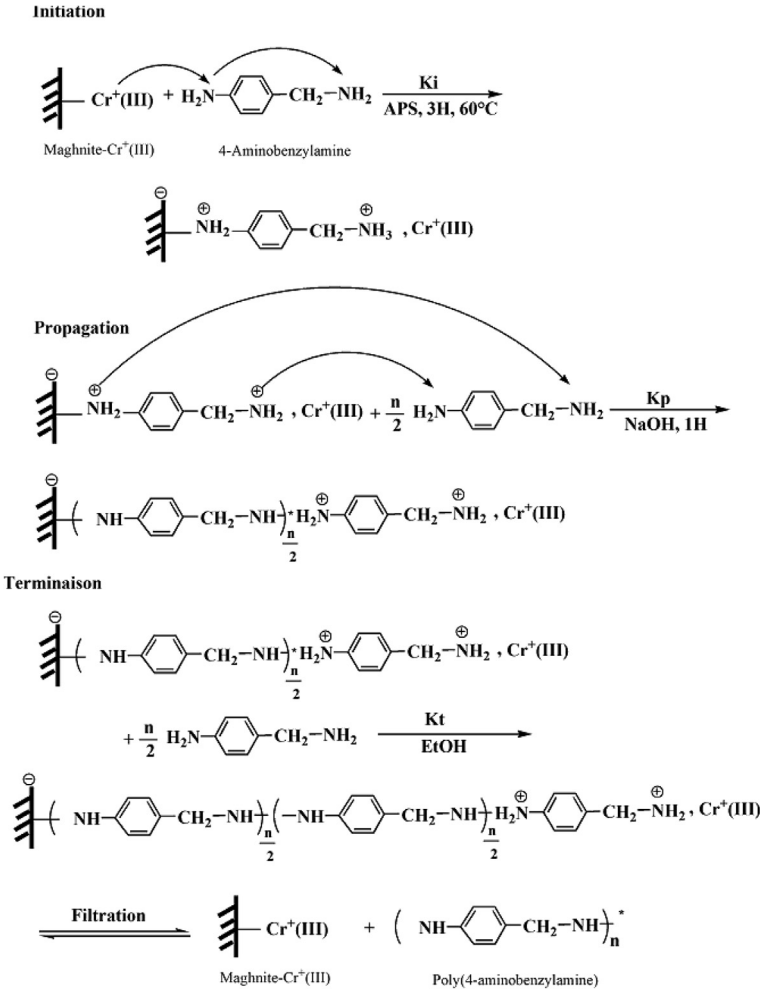

Fig. 10. Proposed mechanism of homopolymer poly (4-aminobenzylamine) catalyzed by Maghnite-H+ by in situ polymerization.

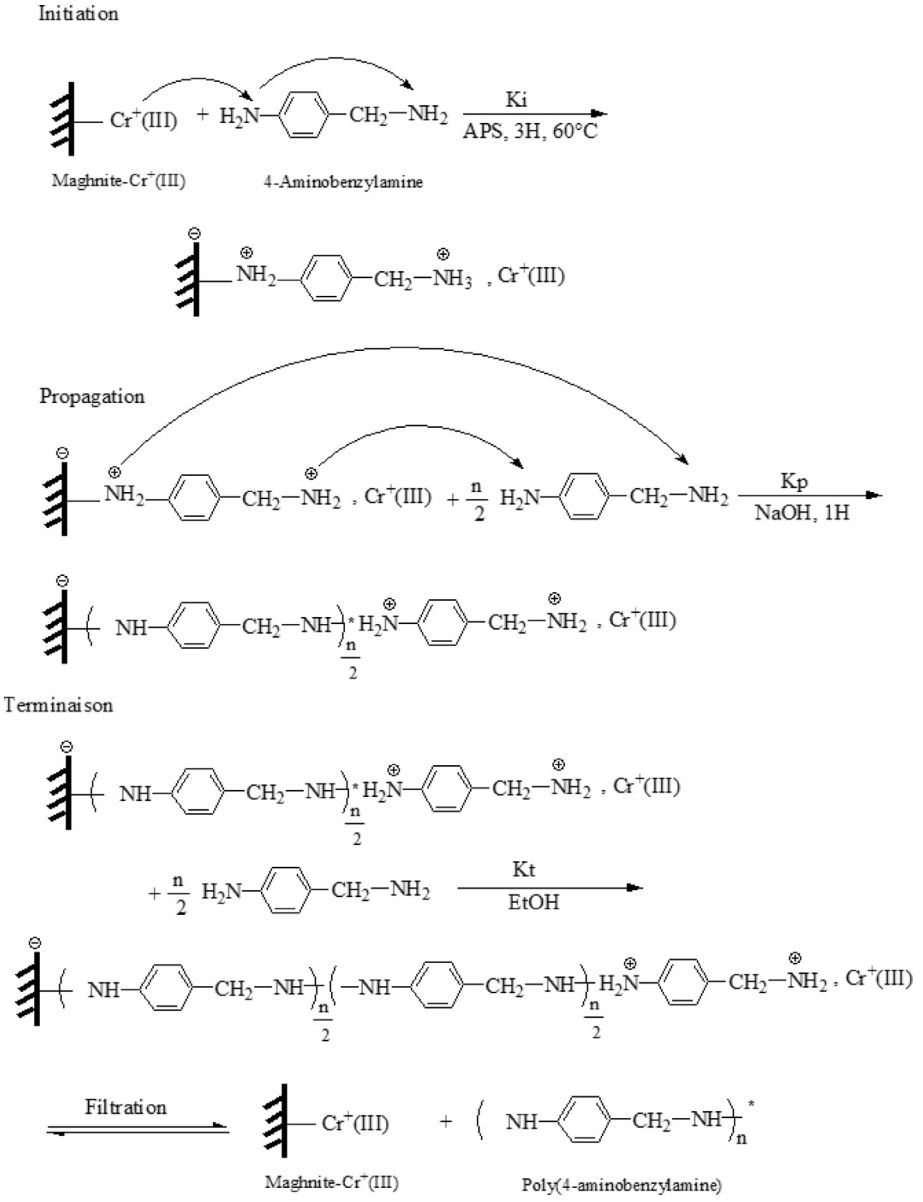

Fig. 11. Proposed mechanism block copolymer poly (aniline)-b-poly (4-aminobenzylamine) catalyzed by Maghnite-H+ by in situ polymerization.

Acknowledgments

This work was supported by the Directorate General of Scientific Research and Technological Development (DGRSDT) of Algeria, and was carried out within the State Program of second national forum.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2020.105161.

References

[1] D.E. Stilwell, S.M. Park, Electrochemistry of conductive polymers. III. Some physical and electrochemical properties observed from electrochemically grown polyaniline, J. Electrochem. Soc. 135 (1988) 2491–2496.
[2] A.J. Dominis, G.M. Spinks, G.G. Wallace, Comparison of polyaniline primers prepared with different dopants for corrosion protection of steel, Prog. Org. Coating 48 (2003) 43–49.
[3] M. Abdel Salam, S.S. Al-Juaid, A.H. Qusti, A.A. Hermas, Electrochemical deposition of a carbon nanotube-poly(O-phenylenediamine) composite on a stainless steel surface, Synth. Met. 161 (2011) 153–157.
[4] V. Shinde, P.P. Patil, Evaluation of corrosion protection performance of poly(O-EthylAniline) coated copper by electrochemical impedance spectroscopy, Mater. Sci. Eng. B 58 (2010) 142–150.
[5] R. Hasanov, S. Bilgic, G. Gece, Experimental and theoretical studies on the corrosion properties of some conducting polymer coatings, J. Solid State Electrochem. 15 (2011) 1063–1070.
[6] F. Alvi, M.K. Ram, P.A. Basnayaka, E. Stefanakos, Y. Goswami, A. Kumar, Graphene polyethylenedioxythiophene conducting polymer nanocomposite based supercapacitor, Electrochim. Acta 56 (2011) 9406–9412.
[7] Y. Zhang, Y. Shao, T. Zhang, G. Meng, F. Wang, High corrosion protection of a polyaniline/organophilic montmorillonite coating for magnesium alloys, Prog. Org. Coating 76 (2013) 804–811.
[8] G. Bereket, E. Hur, Y. Sahin, Electrochemical synthesis and anti-corrosive properties of polyaniline, poly(2-anisidine) and poly(aniline-Co-2-Anisidine) films on stainless steel, Prog. Org. Coating 54 (2005) 63–72.
[9] S. Chaudhari, P.P. Patil, Corrosion protective Bi-layered composites of polyaniline and poly(O-anisidine) on low carbon steel, J. Appl. Polym. Sci. 109 (2008) 2546–2561.
[10] J.M. Yeh, C.P. Chin, Structure and properties of poly(O-Methoxyaniline)/Clay nanocomposite materials, J. Appl. Polym. Sci. 88 (2003) 1072–1080.