Section A-Research paper

Validated Stability Indicating FT-IR Spectroscopic Method for Simultaneous Quantitative Estimation of Aceclofenac and Pregabalin in Combined Tablet Dosage Form

Nalanda Rangari [1]*, Preeti Gaikwad[1], Bismi Cheriyan[1], Bhushan Firake[1], Sanjay Chaudhari[1], Tukaram Kalyankar[2], Vishal S. More[3]

[1]KJs Educational Institute, Trinity College of Pharmacy, Yewalewadi, Pune-411048 Maharashtra, India.

[2]Department of Pharmaceutical Chemistry, School of Pharmacy, Swami Ramanand TeerthMarathwada University, Vishnupuri, Nanded- 431606, Maharashtra, India.

3Assistant Professor,Amrutvahini College of Pharmacy, Sangamner, Maharashtra- 422608

Correspondence should be addressed to Dr. Nalanda Rangari
Email-ID: nalanda.rangari@gmail.com

Abstract

The current study focused on FT-IR spectroscopic method development and validation for simultaneous estimation of aceclofenac (ACF) and pregabalin (PGL) in combined tablet dosage form.Aceclofenac and pregabalin are used in combination for the relief of pain and inflammation in rheumatoid arthritis, osteoarthritis, and ankylosing spondylitis and adjunctive treatment of partial seizure, epilepsy, fibromyalgia, neuropathin pain drug. Literature survey revealed that no method is reported on FTIR method for the simultaneous estimation of the aceclofenac & pregabalin in bulk and combined pharmaceutical dosage form.The method is validated with respect to linearity, precision, accuracy, robustness, ruggedness and system suitability parameters as per ICH guidelines. The developed method was applied to forced degradation studies successfully to verify the utility of the established procedure.

Key Words: Aceclofenac, Pregabalin, Forced degradation studies, FT-IR, Validation and ICH.

1. Introduction

Fourier transformInfrared spectroscopy (FTIR) spectroscopy is one of the most common spectroscopic techniques used by organic and inorganic chemists. Simply, it is the absorption measurement of different IR frequencies by a sample positioned in the path of an IR beam. The main goal of IR spectroscopic analysis is to determine the chemical functional groups in the sample. Fourier transform infrared spectroscopy is simple, rapid, solvent free, economic and eco-friendly technique which plays a major

role for the rapid determination of various components present in the sample as well as complex matrices. In pharmaceutical chemistry FTIR is widely used for the identification of compounds, impurities and determination of functional groups for qualitative analysis of pharmaceuticals and drug in liquid or solid form. Initially, FTIR spectroscopy was considered as a qualitative tool but, since last two decades tremendous quantitative work has been published. Non-destructive and fast analytical nature of FT-IR spectroscopy can be exploited in an advantageous manner in wide range of application in modern industries [1]. Whereas diffuse reflectance infrared Fourier transform (DRIFT) is relatively better technique for quantitative analysis of solid state sample [2].

Aceclofenac is 2-[2-[2-[(2, 6-dichlorophenyl) amino] phenyl] acetyl] oxy acetic acid. It is a nonsteroidal anti- inflammatory drug with good analgesic effect [4] (Figure 1(A)). Pregabalin is S-3-(amino methyl)-5-methylhexanoic acid. It is an anticonvulsant drug for neuropathic pain and adjunct for partial seizures. It can be used in generalised anxiety disorders [5] (Figure 1(B)). ACF is official in British Pharmacopoeia, 2009, Indian Pharmacopoeia, 2007, 2010, and European Pharmacopoeia, 2005 [3 and 11]. PGL is official in Indian Pharmacopoeia, 2010 [3].

ACE is a non-steroidal anti-inflammatory drug which has analgesic and anti-inflammatory activity. ACE is an analog of diclofenac and it is a potent cyclooxygenase-2 inhibitor. ACE is official in IP, BP and USP. The pain management is always a trouble for a physician and searching for a safe and effective alternative is still on. The combination of the PGL (75 mg) and ACE (200 mg) is used for the relief of pain and inflammation in rheumatoid arthritis, osteoarthritis and ankylosing spondylitis. This combination is also used as an adjunctive in the treatment of partial seizures, epilepsy, fibromyalgia and neuropathic pain[13]. It is official in British Pharmacopoeia.The literature survey revealed that few analytical methods have been published concerning the simultaneous estimation of ACF and PGL either alone or in combination with other drugs, namely, UV spectrophotometric [4, 5, 6, 7] and chromatographic [8,9,10,11,12] methods. Several analytical techniques like titrimetric, colourimetric, spectroflurimetric, densitometric, HPLC, RP–HPLC, spectrophotometric and stripping voltametrichave been reported for assay of Aceclofenac. However some of these methods are costlier and time consuming. To overcome these difficulties spectrophotometric analysis serves to be the quickest, promising and reliable method for routine analytical needs[14].

Pregabalin (Lyrica TM) is an antiepileptic drug approved for a number of indications in the US and Europe that include adjunctive therapy of partial seizures in adults, pain from diabetic neuropathy or post-herpetic neuralgia in adults, and the treatment of anxiety disorders.Pregabalin chemically known as (3S)-3-(aminomethyl)-5-methylhexanoic acid is an antiepileptic, anticonvulsant and neurotransmitter. This drug produces its actions by binding to the alpha2-delta (α2δ) subunit of the voltage-gated calcium channels. More recently pregabalin has been approved by the FDA for the treatment of spinal cord injury and as the first drug indicated for the treatment of fibromyalgia and pregabalin received U.S.FDA approval for use in treating epilepsy,

diabetic neuropathy pain and post herpetic neuralgia[15,16]. Recently, capillary electrophoresis and nuclear magnetic resonance technique was reported for PGL involving complexation with cyclodextrins [17]. The chromatographic methods require high cost solvents in addition to tedious pretreatment, Regarding spectrophotometric methods for determination of PG; some of them don't offer high sensitivity or need tedious extraction procedures[18.]

According to literature survey, there was not any developed analytical method which has beenreported for simultaneous estimation of PGLand ACF in combined dosage form. So an attempt was being made to a developed simple, accurate, precise, economical and reproducible FT-IR spectroscopic method for simultaneous estimation of PGL and ACF in combined tablet dosage form.

2. Experimental Work

2.1.Reagents and Materials:

ACF and PGL pure API were procured as a gift sample from Lupin Pharmaceuticals, Pvt. Ltd. and Concept Pharmaceutical Pvt. Ltd. Aurangabad. All employed chemicals were of Spectroscopic grade.

2.2. Instruments:

Spectrophotometric measurements were carried on FT-IR spectrophotometer Serial no-A213747 (IR-Affinity-1, Shimadzu Corp., Japan)equipped with diffuse reflectance sampling interface and attached with computer operated Shimadzu IR solution software was used for collection and analyze the data. It also equipped with detector-DLATGS and uses a high-energy long life ceramic light source. FT-IR spectrum was recorded in range of 400-4000 cm^{-1} with 45 scans and resolution of 8 cm^{-1}. Analytical weighing balance (AA-2200), [Max.200g, Min. 0.01g; e = 0.0001g] and hot air oven were used during the study.

2.3 Diluent selection:

Both the drugs were found to be compatible with potassium bromide. Here solid sampling method is used for FT-IR method development and validation. KBr is selected as diluent because it is transparent to IR- radiation and its peaks does not interfere with peaks of drugs

2.4 Preparation of working standard (0.5 % w/w):

AccuratelyACF (5mg) and PGL (5mg) pure drugs were mixed separately with 995 mg of KBr (spectroscopic grade). Triturated well and made homogenous mixture.

2.5 Selection of analytical wave number:

Working standard (0.5 % w/w) of both drugs was scanned in IR range of 4000-400 cm^{-1} with resolution of 4 and 45 scans. Wave number was selected in such a way that one functional group of one drug should not present in another drug so that one can avoid interference of one drug in another. Wave number (peak area) parameter is selected for both drugs, in that one can select wave number in a range. Functional group selected for ACF is $-NH_2$ (amine) and wave number found in range of 3300-3200 cm^{-1}. Functional group selected for PGL is -COOH (carboxylic acid) and wave number found in range of 1660-1600 cm^{-1}. FT-IR spectrum of ACF, PGL and mixed standards are shown in Figure 2 and FT-IR spectrum of marketed tablet formulation,

mixed standard and tablet excipients (Extracted from tablet formulation by using acetone sonicated for 30 min.) are shown in Figure 3.

2.6 Selection of analytical concentration range and linearity study (Preparation of calibration curve):

Pure drug sample of ACF and PGL was diluted with KBr to get concentration ranging from 0.8-4.8 % w/w and 0.3-1.8 % w/w for ACF and PGL respectively. Peak area of these dilutions was measured in range of 3300-3200 cm^{-1} and 1660-1600 cm^{-1} for ACF and PGL respectively using KBr as blank. Plot of peak area versus concentration were found to be linear at respective wave number region and they are shown in Figure 4 and data are given in Table 1. The absorbance of ACF standard (NH_2group) in linearity spectrum and absorbance of PGL standard (-COOH group) in linearity spectrum are shown in Figure 5 and 6 respectively. The optical characteristic and other parameters are shown in Table 2.

2.7 Analysis of marketed tablet formulation:

Twenty tablets of marketed formulation ACENAC-N were accurately weighed and average weight was calculated, then these tablets were crushed to fine powder. The quantity of powder equivalent to 40 mg of ACF and 15 mg of PGL were weighed and mixed with dried KBr, finely powdered KBr and dilution was made 4.0 % w/w for ACF and 1.5 % w/w for PGL respectively and scanned in in range of 4000-400 cm^{-1} with resolution of 4 cm^{-1} and 45 scans. The analysis procedure was repeated six times with tablet formulation. The results of analysis of marketed tablet formulation are given in Table 3.

3. Method Validation

The proposed method was validated for accuracy, precision, and linearity, limits of detection (LOD) and quantification (LOQ), and reproducibility. The method validation was performed as per ICH Guidelines (ICH, Q2 (R1): 2005)

3.1 Linearity and range

Calibration curves were prepared for six different ACF & PGL concentrations in the range of 0.8- 4.8 % w/w & 0.3-1.8 % w/w respectively. Required quantity of ACF was diluted with potassium bromide to get around 1000 mg and triturated to ensure sample homogeneity. Each calibration standard was analyzed in the replicates of six. Area under curve (AUC) corresponding to the amine peak around 3300-3200 cm^{-1}& the carboxylic acid peak around 1660-1600 $cm^{-1}$was used for the quantification and the average of six measurements was used to obtain the calibration curve for ACF and PGL respectively . The linearity of proposed method was found to be in between 0.8-4.8 % w/w for ACF and 0.3-1.8 % w/w for PGL. Regression coefficient is 0.995 & 0.995 for ACF and PGL respectively.

3.2 Precision

The repeatability was evaluated by assaying six times the sample solution prepared for assay determination. Precision of the method was evaluated by interday and intraday variation studies. In intraday studies, working solutions of standard and sample were analyzed thrice in a day and percentage relative standard deviation (% RSD) was calculated. In the interday variation studies, working solution of standard

and sample were analyzed on two consecutive days and percentage relative standard deviation (% RSD) was calculated. The result of repeatability study and intermediate precision study are given in Table 4 and Table 5 respectively.

3.3Accuracy

To check the accuracy of the proposed method, recovery studies were carried out at 80%, 100% and 120% of the test concentration as per ICH guidelines. As per the label claim, tablet contains 200 mg of ACF and 75 mg of PGL. For recovery studies different levels of the standard concentration according to 80%, 100% and 120% are made and % mean recoveries was calculated. The result of recovery studies are given in Table 6 and graphical representation given in Figure 7.

3.4 Detection Limit and Quantitation Limit

ICH guideline describes several approaches to determine the detection and quantitation limits. These include visual evaluation, signal to noise ratio, and the use of standard deviation of the response and the slope of the calibration curve. In the present study, the LOD and LOQ were based on the third approach and were calculated according to the 3.3σ/S and 10 σ/S criterions, respectively.

The LOD and LOQ may be calculated as;

$$LOD = 3.3 * \left(\frac{SD}{Slope}\right) \ldots\ldots\ldots (1) \qquad LOQ = 10 * \left(\frac{SD}{Slope}\right) \ldots\ldots\ldots (2)$$

Where, SD is the standard deviation of Y-intercept of Calibration curves.

Slope is the mean slope of the calibration curves.

3.5 Determination of ACF and PGL in Their Combined Tablet Dosage Form

Accurately weighed 20 tablets of marketed formulation ACENAC-N and average weight were found to be 719 mg. This tablet were crushed to fine powder and from this powder equivalent to 200 mg of ACF and 75 mg of PGL was mixed with 143.8 drug powder mix with 856.2mg of KBr and dilution made to get4 % w/w for ACF and 1.5 % w/w for PGL respectively.

3.6 Force Degradation Studies: (ICH, Q1A (R2); Q6A; Q5C; Q7; Q1B: 2005, Singh and Bakshi et al. 2000)

3.6.1Photolytic degradation:

Pure drugs were exposed to UV radiations for 6 hours and samples were withdrawn at interval of 30 min. The samples after exposure to light were diluted with KBr to get ACF(0.5% w/w) and PGL (0.5 % w/w). Peak area was measured at 3300-3200 cm^{-1}& 1660-1600 $cm^{-1}$for ACF and PGL respectively. Finally peak area of sample was compared with standard peak area and percent degradation and percent assay was calculated.

3.6.2 Thermal degradation:

Thermal degradation was carried out by exposing pure drugs to dry heat at 80ºC for hrs. Samples are withdrawn at interval of 30 min. The samples after exposure to heat diluted with KBr to get ACF (0.5 % w/w) and PGL (0.5 % w/w). Peak area was measured at 3300-3200 cm-1 & 1660-1600 cm-1 for ACF and PGL respectively. Finally peak area of sample was compared with standard peak area and percent degradation and percent assay was calculated.

3.6.3 Degradation in Sunlight:

Sunlight degradation is performed by exposing the pure drugs to sunlight in open space for 6 hrs. Samples are withdrawn at interval of 30 min. The samples after exposure to sunlight diluted with KBr to get ACF (0.5 % w/w) and PGL (0.5 % w/w). Peak area was measured at 3300-3200 cm-1 & 1600-1660 cm-1 for ACF and PGL respectively. Finally peak area of sample was compared with standard peak area and percent degradation and percent assay was calculated

4. Result and Discussion

In the present work, new IR spectrophotometric method was developed for determination of ACF and PGL. The linearity was observed in the concentration ranges between 0.8 – 4.8 %w/w for ACF and 0.3 – 1.8 %w/w for PGL with coefficients of correlation r^2= 0.995 and r^2= 0.995 for ACF and PGL at 3300-3200 cm^{-1}& 16600-1660 cm^{-1}respectively. Marketed formulation containing ACF and PGL was analysed by proposed method. Mean assay values in ACENAC-N tablet were found to be 99.84%±1.3794% RSD and 99.9997% ±0.2793 % RSD for ACF and PGL respectively. The accuracy of method was determined by recovery studies. Pure ACF and PGL were added to the pre analyzed tablet powder at three different levels i.e. 80%, 100% & 120% of label claims as per the ICH guidelines. The RSD value below 2% indicated that the method has required precision. The limit of quantitation of ACF and PGL were found to be 1.5504 %w/w and 0.8680%w/w respectively. Limit of detection was found to be 0.5116 %w/w and 0.2864 %w/w for ACF and PGL respectively. The proposed spectrophotometric method was successfully applied to ACF and PGLin combined tablet dosage form.

The stress degradation studies showed that ACF & PGL undergoes degradation thermal, photolytic and sunlight condition and percentage degradation was found to be 45.38, 42.66, 21.52 and 24.37, 42.12, 43.42 for ACF and PGL

A simple, rapid, accurate, precise, selective and reproducible FT-IR method for thequantitation of aceclofenac and pregabalin tablet was developed and validated. The results indicate the method to be sensitive, selective, accurate and reproducible. Sample preparation is very simple and it involves mixing of APIand KBR. From the results of all the validation parameters we can conclude that the present method can be useful for simultaneous estimation ofAceclofenac and Pregabalin Tablets with desired precision and accuracy. The linearityrange was from 0.8- 4.8 % w/w for aceclofenac and 0.3-1.8 % w/w for pregabalin.The developed method it will be validate as per ICH guidelines. The proposed method shows good agreement with all validation parameters. There should not be any interference from KBr and blank with main peak.

5. Conclusion

The proposed FT-IR method was found to be simple, sensitive, accurate, and precise for estimation of ACF and PGL in combined dosage form. The common excipients and additives which are usually present in the combined dosage form do not interfere in the analysis of ACFand PGL in the method; hence it can be conveniently adopted for routine quality control analysis of the drugs in combined dosage form.

6. Acknowledgements

Authors are heartily thankful to Lupin Pharmaceuticals Pvt. Ltd., Aurangabad, India and Concept Pharmaceuticals Pvt. Ltd., Aurangabad, India for providing pure standard drug samples. The authors also express gratitude to the management and the Director, School of Pharmacy S.R.T.M.U. Nanded, Maharashtra, India for providing amenities to carry out research work.

7. References

1. Konoz E.; Sarraf AHM; Samadiz deh M.; Boreiri S.; Quantitative Analysis of Lorazepam in Pharmaceutical Formulation Through FTIR Spectroscopy: E-Journal of Chemistry, 2012, 9, 2232-2238
2. Bansal R.; Guleria A.; Acharya PC.; FT-IR Method Development and Validation for Quantitative Estimation of Ziduvudine in Bulk and Tablet Dosage Form: Drug Res. 2013, 63, 165-170
3. Indian Pharmacopoeia; 2007, (II), Aceclofenac: 58 & Indian Pharmacopoeia; 2010, (III), Pregabalin: 166, 405, 1960-1962,
4. Rohit Shah, Chandrakant Magdum, Shital Kumar Patil, Dhanya Kumar Chougule and Nilofar Naikwade, Validated Spectroscopic Method for Estimation of Aceclofenac from Tablet Formulation, Research J. Pharm. and Tech. 1(4): Oct.-Dec. 2008; Page 430-432
5. Nawab Sher, Nasreen Fatima, Shahnaz Perveen, Farhan Ahmed Siddiqui, and AlishaWafa Sial, Pregabalin and Tranexamic Acid Evaluation by Two Simple and Sensitive Spectrophotometric Methods, International Journal of Analytical Chemistry, December 2014; Page 1-8
6. Santosh G. Shep, S.R. Lahoti, Development and Validation of UV Spectrophotometric Method of Pregabalin In Bulk And Pharmaceutical Formulation, International Journal of PharmTech Research, Vol.5, No.3, July-Sept 2013, Page 1264-1270,
7. Raafia Najam, Gh Mohd Shah, and S Muzaffar Ali Andrabi, Kinetic spectrophotometric determination of an important pharmaceutical compound, pregabalin, Journal of Analytical Science and Technology, 2013, Page 4:22
8. Leela Madhuri Pola1, D.Gowri Sankar2, Validated stability indicating RP-LC method for simultaneous quantitative estimation of aceclofenac and pregabalin in bulk drug and combined tablet dosage form, Int J Pharm Biomed Res 2014, 5(4), 78-84
9. Naresh Chandra Reddy M and Chandra Sekhar KB, RP-HPLC Determination of Related substances of Pregabalin in bulk and pharmaceutical dosage form,International Journal ofChemical and Pharmaceutical Sciences 2012, June, Vol. 3 (2), Page 40-46
10. Shantaram Gajanan Khanagea, Dnyaneshwar Santram Kaleb, Popat Baban Mohitea, VinayakKashinath Deshmukhb, Reversed Phase High Performance Liquid Chromatographic Method for Simultaneous Estimation of Pregabalin

and Aceclofenac in Tablet Formulation (Acenac-N),journal of Reports in Pharmaceutical Sciences, 2014, 3(2), Page 184-192

11. Hitendrakumar D. Gelani, Payal P. Chauhan, and Samir K. Shah,Practical Implication of Chromatographic Method for Estimation of Aceclofenac and Pregabalin in Bulk and Pharmaceutical Dosage Forms, Chromatography Research International Volume 2014, Pages 5
12. AkshayTripathi, R.P.S Rathor, P.R.Kamble, Girish Vyas, Reverse Phase HPLC Method for Estimation of Acelofenac and Pregabalin in Combined Dosage Form, International Journal of Pharmamedix India, 2014, 2(3), 764-80.
13. Shantaram Gajanan Khanagea, Dnyaneshwar Santram Kaleb, Popat Baban Mohitea, VinayakKashinath Deshmukhb, Reversed Phase High Performance Liquid Chromatographic Method for Simultaneous Estimation of Pregabalin and Aceclofenac in Tablet Formulation (Acenac-N),journal of Reports in Pharmaceutical Sciences, 2014, 3(2), Page 184-192
14. Rohit Shah, Chandrakant Magdum, Shital Kumar Patil, Dhanya Kumar Chougule and Nilofar Naikwade, Validated Spectroscopic Method for Estimation of Aceclofenac from Tablet Formulation, Research J. Pharm. and Tech. 1(4): Oct.-Dec. 2008; Page 430-432
15. Vaishali,Vikas Singh, Rajnish Kumar Singh, Ramesh Kumar Gupta, Sudhansu Ranjan Swain, Jagannath Sahoo,Development And Validation Of RP-HPLC Method Forthe Assay Of Pregabalin Capsule, World Journal of Pharmacy and Pharmaceutical Sciences, Volume 3, Issue 1, 703-711.
16. Naresh Chandra Reddy M and Chandra Sekhar KB, RP-HPLC Determination of Related substances of Pregabalin in bulk and pharmaceutical dosage form,International Journal of Chemical and Pharmaceutical Sciences 2012, June, Vol. 3 (2), Page 40-46
17. Alka Bali and Prateek Gaur, A novel method for spectrophotometric determination of pregabalin in pure form and in capsules, 2011, Chem Cent J. 2011; 5: 59.
18. Hanaa M. Saleh, Magda M. EL-Henawee, Gamal H. Ragab and Omnia F. Mohamed, Spectrophotometric and Spectrofluorimetric Determination Of Pregabalin Via Condensation Reactions In Pure Form And In Capsules, International Journal Of Pharmaceutical, Chemical And Biological Sciences, 2014, 4(3), 738-747
19. Uttam D. Pawar, Abhijit V.Naik, Aruna V. Sulebhavikar, Tirumal A. Datar and Kiran.V. Mangaonkar, Simultaneous Determination of Aceclofenac, Paracetamol and Chlorzoxazone by HPLC in Tablet Dose Form, Journal of Chemistry journals. 2009, 6(1), 289-294
20. Sherin F. Hammad and Ola M. Abdallah, Optimized and Validated Spectrophotometric Methods for the Determination of Pregabalin in Pharmaceutical Formulation Using Ascorbic Acid and Salicylaldehyde, Journal of American Science 2012;8(12).

21. Merin k Oommen. et al., uv-vis spectrophotometric method for estimation of pregabalin and methylcobalamin in bulk and capsule dosage form, International Journal of Pharmaceutical Research and life Sciences. 1(2), 2013, 115 - 124.
22. Bhatt et al., Simultaneous Estimation of Pregabalin and Methylcobalamin in Pharmaceutical Formulation by RP-HPLC Method, Journal of Analytical & Bioanalytical Techniques 2013, 4:1.
23. Kavitha M P et al., Validated HPLC Method for the Analysis of Pregabalin and Methylcobalamin in Bulk and Pharmaceutical Formulation, Pharmacie Globale (IJCP) 2013, 07 (04).
24. N. Kannapan et al., Analytical RP-HPLC Method for Development and Validation of Pregabalin and Methylcobalamin in Combined Capsule Formulation, J. Appl. Chem. Res., (2010) 13, 85-89.
25. Kim Huynh BA. Handbook of stability testing in pharmaceutical development & regulation, Methodology and best practice. DOI 10.1007/978-0-387-85627-8 2, c- Springer science plus business media, LLC 2009.

TABLE 1: Standard calibration data for ACF and PGL

ACF		PGL	
Conc. (%w/w)	Peak area (3300-3200 cm^{-1})	Conc. (%w/w)	Peak area (1660-1600 cm^{-1})
0.8	32.718	0.3	11.347
1.6	38.835	0.6	15.078
2.4	43.436	0.9	17.938
3.2	47.284	1.2	20.777
4.0	54.086	1.5	25.048
4.8	58.750	1.8	28.875

TABLE 2: Optical characteristics and other parameters

Parameters	ACF	PGL
Wave number (cm^{-1})	3300-3200 cm^{-1}	1660-1600 cm^{-1}
Linearity range (%w/w)	0.8-4.8	0.3-1.8
$y = mx \pm c$	$y = 6.42x + 27.875$	$y = 11.466 + 7.804$
Slope (m)	6.42	11.466
Intercept (c)	27.875	7.804
Regression coefficient (R^2)	0.995	0.995
Limit of detection (% w/w)	0.5116	0.2864
Limit of quantitation (% w/w)	1.5504	0.8680

TABLE 3: Assay of marketed formulation: ACENAC-N (ACF-200/PGL75)

Drug	Label claim (mg)	Amount found (mg)*	% Found*	SD	% RSD
ACF	200	200.141	99.84	1.3772	1.3794
PGL	75	75.013	99.99	0.2793	0.2793

*Indicates average of six determinations

TABLE 4: Repeatability data of standard drug mixture

Drug	% Found*	SD	% RSD
ACF	98.20	0.8961	0.9125
PRG	99.019	0.3836	0.3874

*Indicates average of six determinations

TABLE 5: Data for intra-day and inter-day precision

Drug	Intra-day precision			Inter-day precision		
	% Found*	SD	% RSD	% Found*	SD	% RSD
ACF	99.893	0.1385	0.1386	99.038	1.6250	1.6407
PRG	99.84	0.0737	0.0739	98.44	1.3860	1.4079

*Indicates average of six determinations

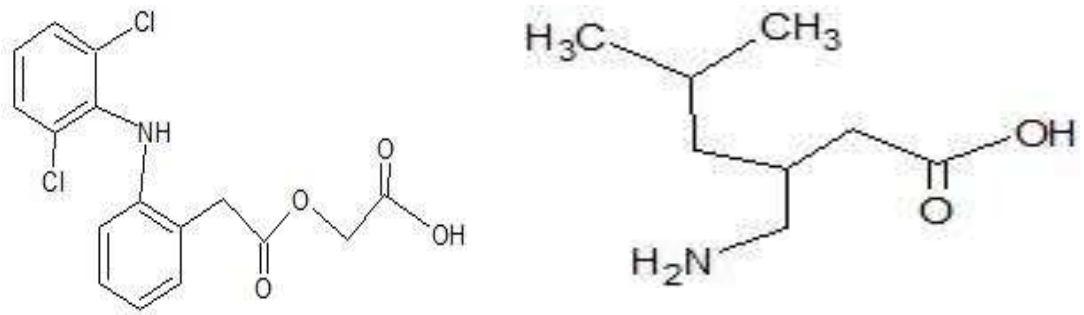
TABLE 6: Results of recovery study

Drug	Amount present	Amount added	Amount found*	% Recovery*	SD	%RSD
ACF	4	3.2	7.2	99.408	0.8501	0.8551
	4	4	8.0	99.689	0.4086	0.4099
	4	4.8	8.8	99.678	0.3494	0.3506
PGL	1.5	1.2	2.7	99.513	0.2442	0.2454
	1.5	1.5	3	99.564	0.3031	0.3044
	1.5	1.8	3.3	99.390	0.5069	0.5101

*Indicates average of six determinations

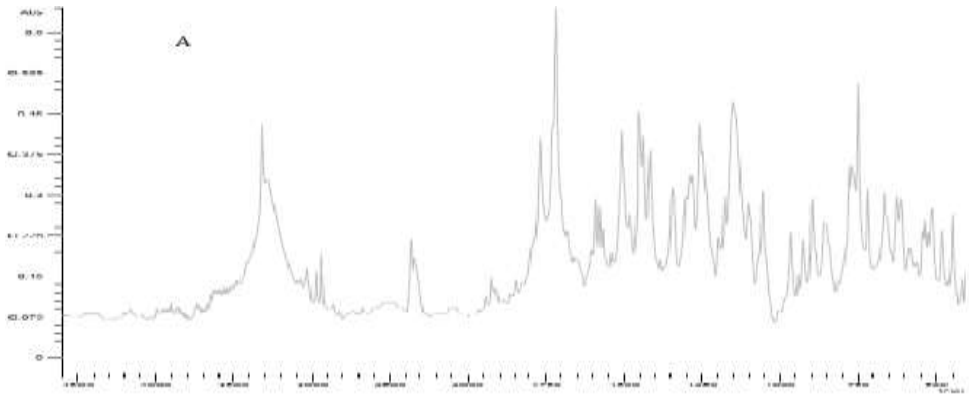
TABLE 7: Data of forced degradation study

Degradation condition	% Degradation		% Assay	
	ACF	PGL	ACF	PGL
Thermal	45.38	24.37	54.62	75.63
Photolytic	42.66	42.12	57.34	57.88
Sunlight	21.52	43.42	78.48	56.58



(A) (B)

FIGURE 1: Chemical structure of (A) Aceclofenac and (B) Pregabalin



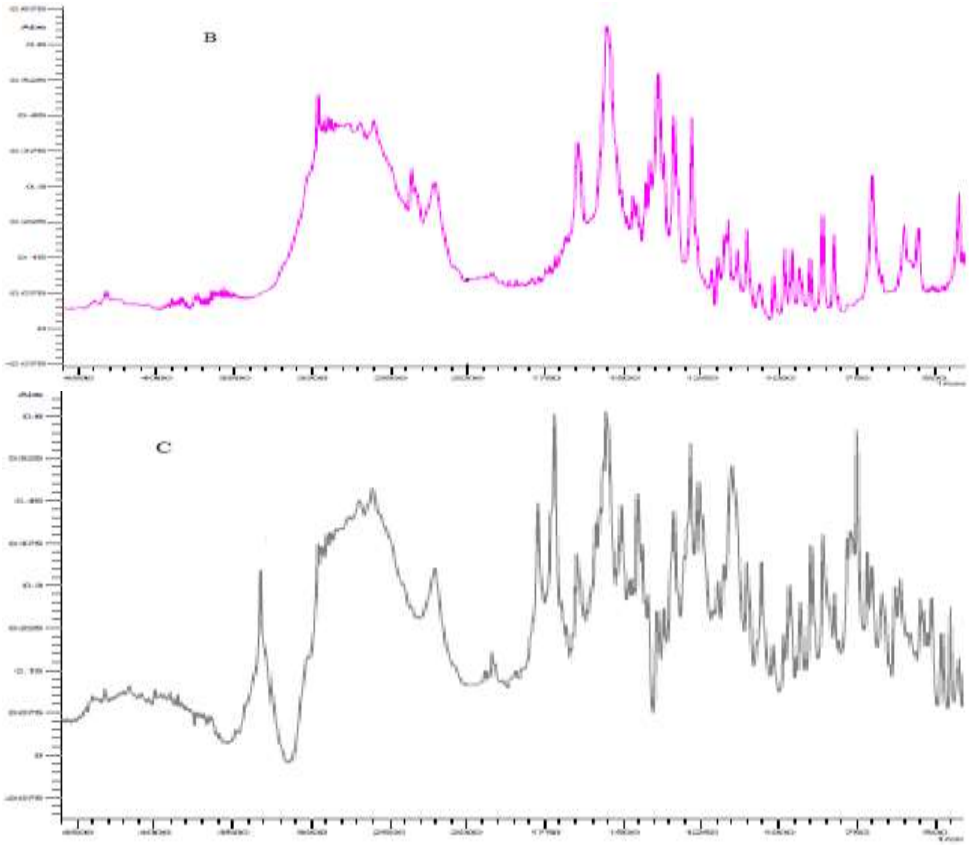
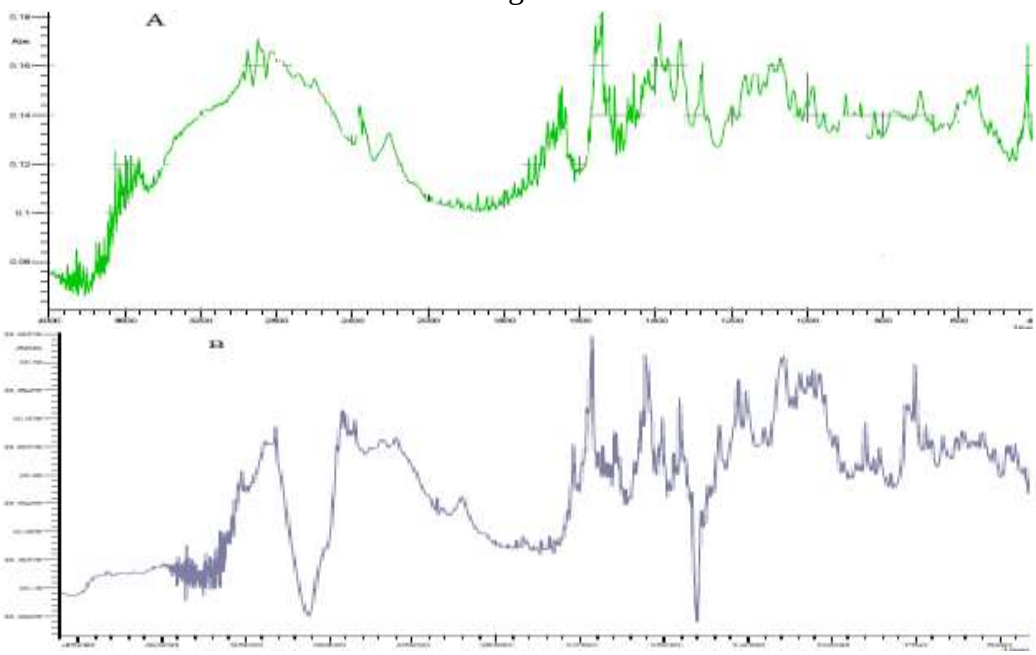


FIGURE 2: FT-IR spectrum of (A) ACF, (B) PGL and (C) Mixed standard drugs



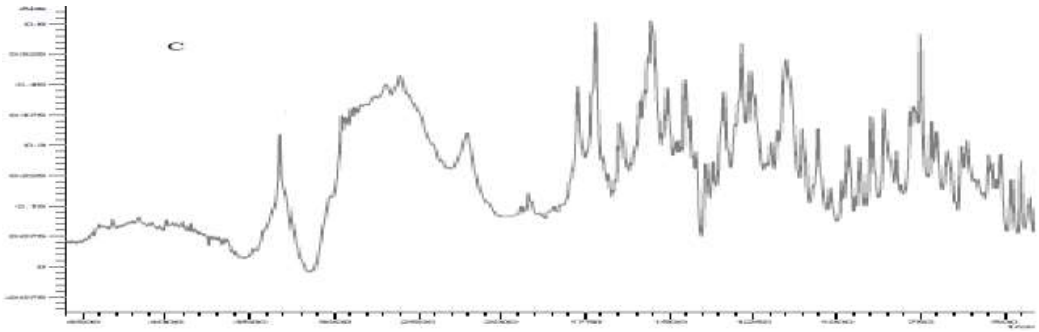
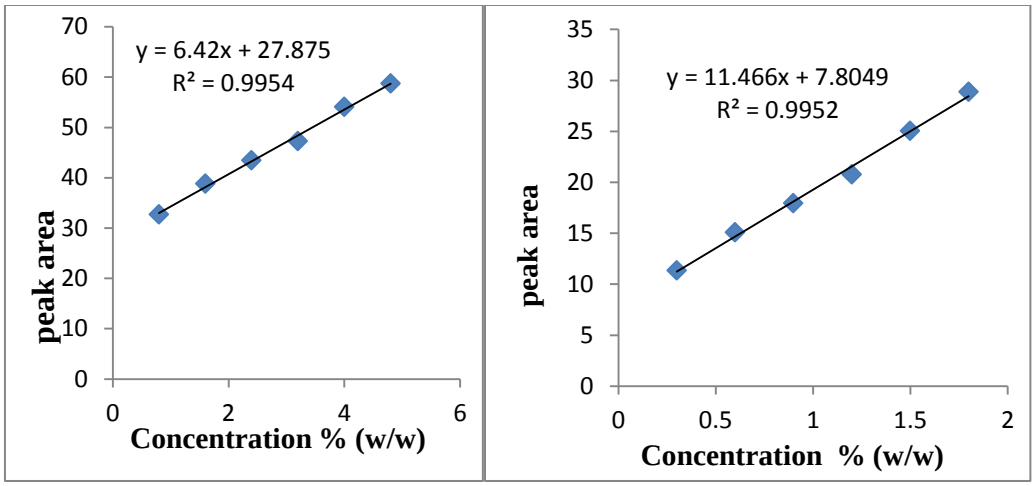


FIGURE 3: FT-IR spectrum of (A) tablet excipients,(B) marketed tablet formulation and (C) mixed standard drugs



(a)(b)

FIGURE 4: Calibration curve for (a) ACF and (b) PGL

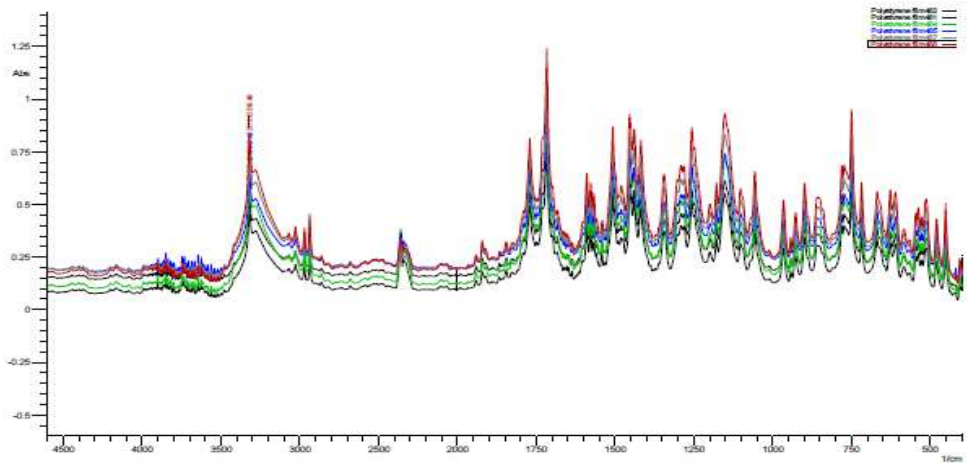


FIGURE 5: Absorbance of ACF standard (NH_2group) in linearity spectrum

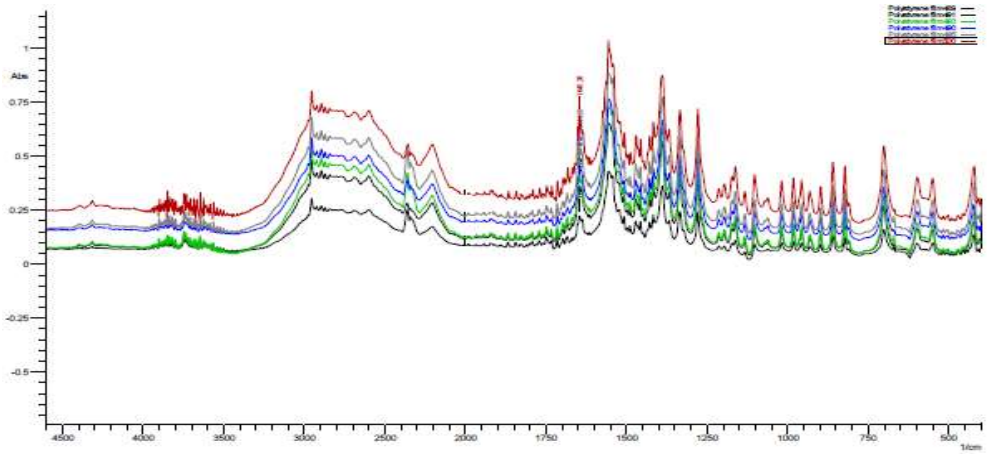


FIGURE 6: Absorbance of PGL standard (-COOHgroup) in linearity spectrum

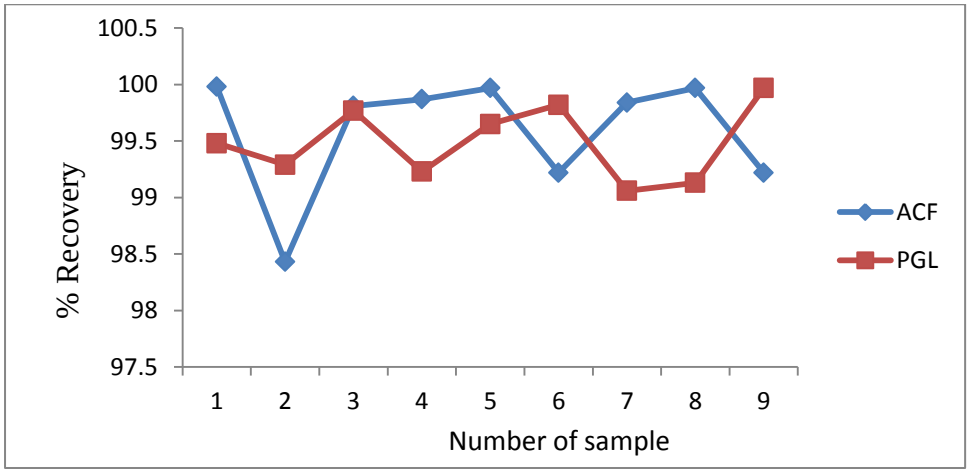


FIGURE 7: Graphical representation of result recovery study

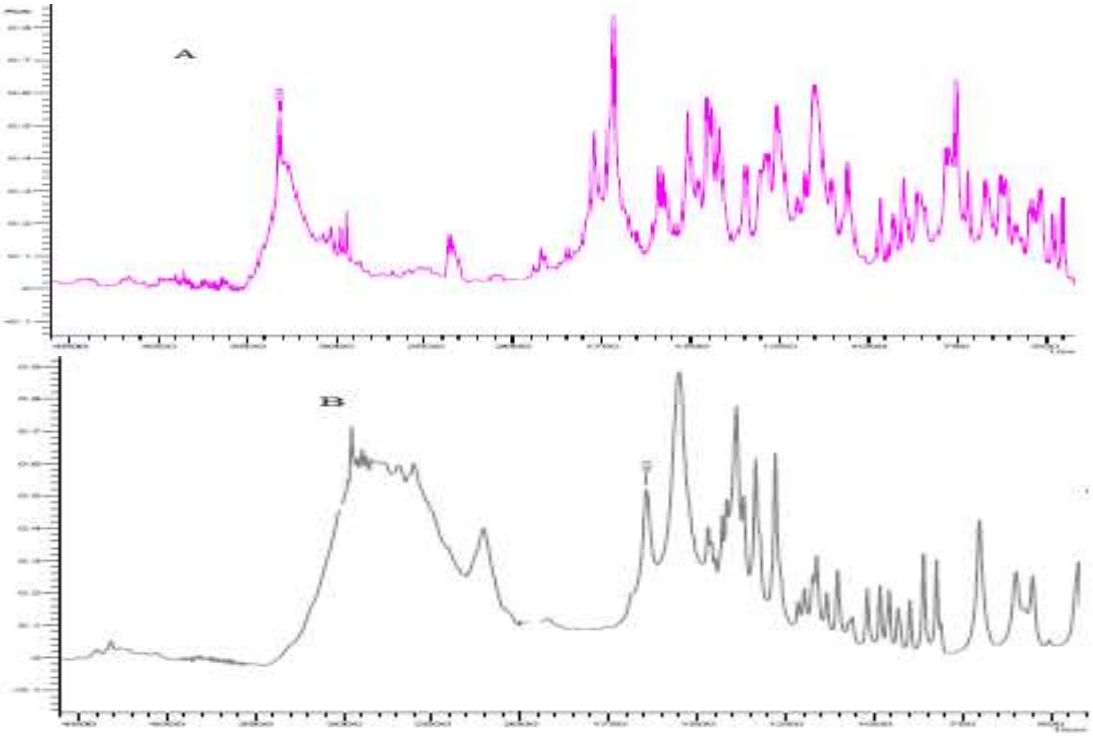


FIGURE: 8 Thermal degradation of (A) ACF in 60 min. and (B) PGL in 30 min.

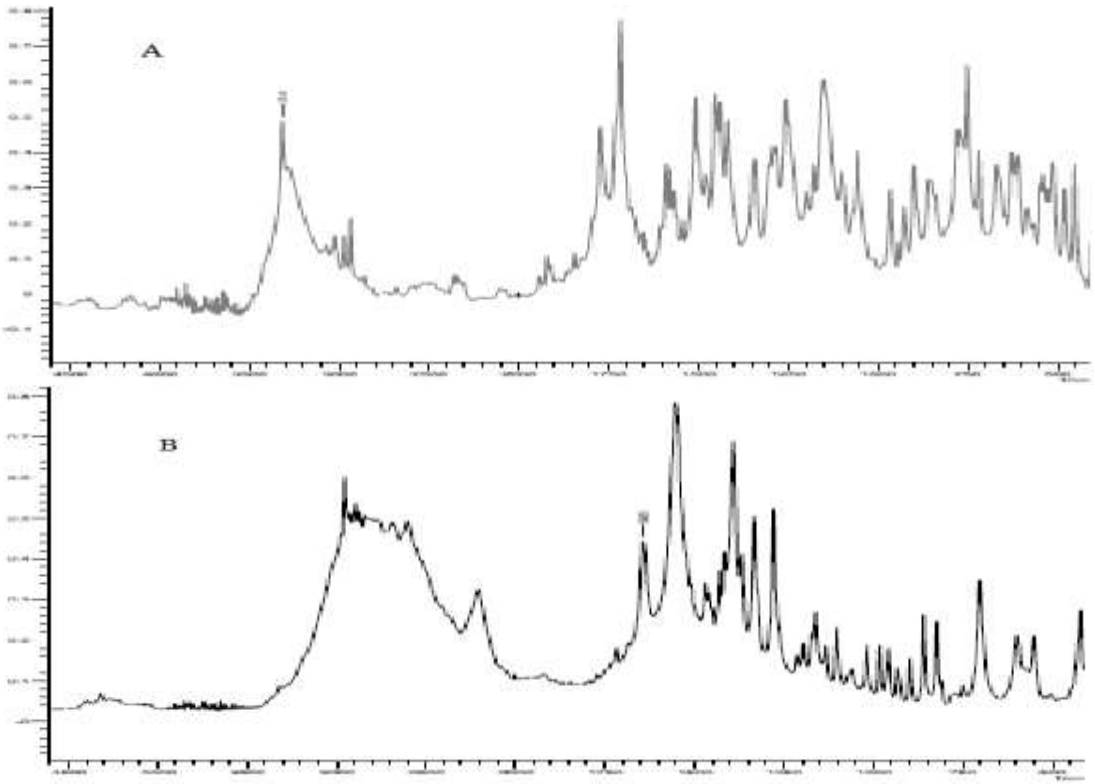


FIGURE 9: Photolytic degradation of (A) ACF in 90 min. and (B) PGL in 60 min.

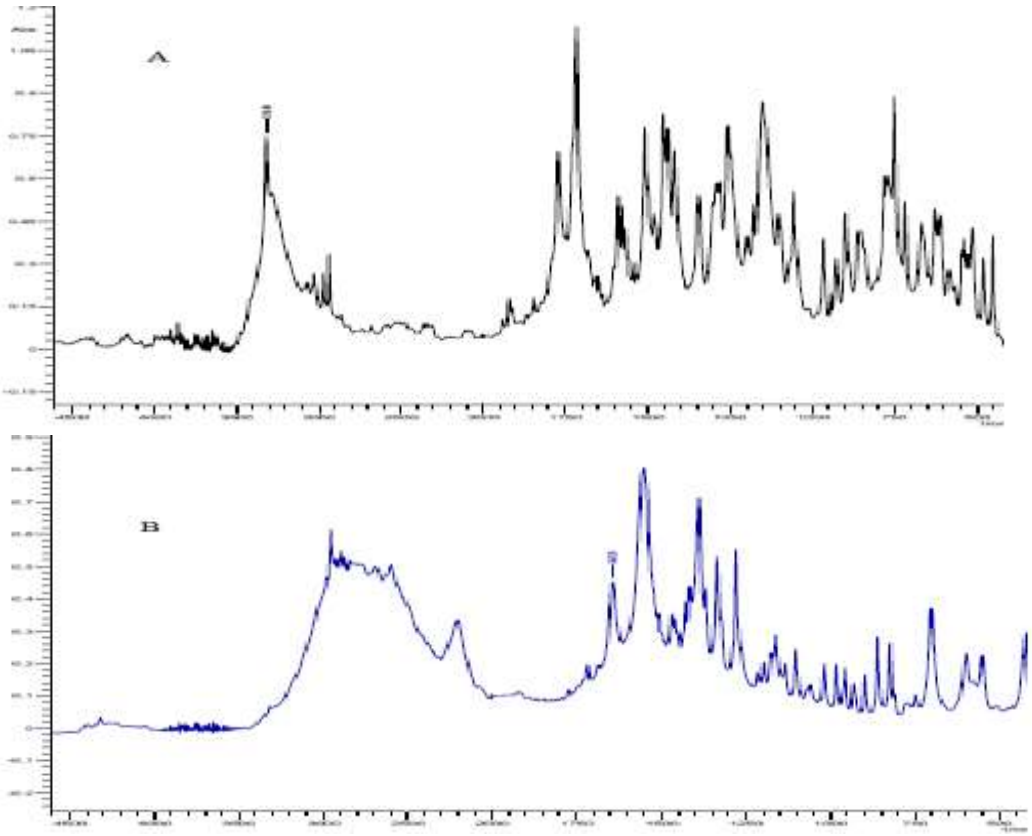


FIGURE: 10 Sun light degradation of (A) ACF in 60 min and (B) PGL in 60 min.