The Effect of the Topolitosequnces on The Mineral Properties of Some Soils of Sulaymaniyah Governorate / Kurdistan Region

Somaya Saad Al-obaidy[1], Salman Kalaf Essa[2]

[1,2]*College of Agriculture Engineering Science, University of Baghdad, Baghdad Iraq*

KEYWORDS
Mineral Formation, Soil Sequences, Parent Martials, Sulaymaniyah Governorate

ABSTRACT
This study was conducted to determine the effect of different parent materials and topography on the mineral composition Sulaymaniyah Governorate was chosen as a site for its conduct. Select transact of study within the Bazian Plain extending from the Bazian Heights in the west to the Taslujah Heights in the east. The results were: The predominance of clay minerals is chlorite > smectite > mica > Interstratified minerals > kaolinites. The predominance of the minerals chlorite, smectite, and mica in the clays of these soils is mainly due to the influence of their parent material (limestone, limestone, Maral), especially within Pedons, the high areas at both ends of the aforementioned study transect (Taslujah, Bazian), whose parent material consisted of rocks. (Limestone and limestone-Maral) respectively. While the dominance of mica minerals within the soils of the plains of the plain region is due to the influence of the source material, slope, topography, and distance from high ends.

1. Introduction

Soils are formed as a result of the factors and processes of soil formation over time, which include the weathering of geological materials and their transformation, under different conditions, into weathering products similar or different to the original material. The intensity of this transformation depends on the intensity of the influencing factors and the type of the original material (Fayyadh & Ismail, 2020**).** The study of sequences is one of the tasks of soil survey that diagnoses, characterizes and classifies the soil to develop successful plans for its management, as revealing the geomorphology of the soil and its biological interpretation and changes in the chemical, physical and biological properties of the soil is one of the tasks required to determine the administrative procedures required to be implemented to manage these lands and determine Its best use (Al-Ugaily, 2020). Soil sequences is defined as the process of stabilizing the soil formation factors with the exception of one factor, which is the variable that results in soils that are similar in everything, except for the effect of this variable factor (Schaetzl & Anderson, 2005). Sequences are also considered a means of studying soil (it is considered metaphorical), as this cannot be fixed. One factor or another, but choosing what is found in nature from soils with similar conditions and resulting in a group of soils that are similar in all properties are linked to the fixed factor, but their properties differ. When studying any factor of soil formation, the rest of the factors must remain constant (Ali & Suleiman, 2022). Soils that arise on a slope whose properties gradually change as a result of changing the slope are called a TOopsequence. Whereas soils that arise from different parent materials while other factors remain constant are called a lithosequnence. In studying the parent material of the soil, it is necessary to review sources regarding the geological formation of the study area, accompanied by an initial scouting visit to verify and benefit from the information, as well as collecting information about the locations of rocks and stones and linking them to the topography along with knowledge of the factor transporting the sediments, as the parent material of the soil begins with the physical and chemical weathering of the rocks. , followed by the soil body beginning to form as a result of various pedagogical processes, which result in different soil horizons (Foster et al., 2021). The topographic location is one of the most influential factors in the emergence and development of soil (Lybrand & Rasmussan, 2015). Topography plays a major role in influencing the nature of soil materials through the properties of the soil, the most important of which are the thickness of the Solum layer, the thickness of the A layer, its content of organic matter, the amount of moisture in the soil bed, and the color. Soil, the degree of differentiation of horizons, the degree of soil interaction, the content of dissolved salts, the type and degree of development of the endocrine layer, temperature, distribution

of primary and secondary minerals, and other characteristics that are directly related to soil formation processes. In view of the importance of studying the nature of mineral formation, especially clay minerals, to know the nature of weathering to which the soil is exposed and the role that these minerals play in understanding the origin of the soil and the origin of its source, understanding the processes and environments of its deposition, and the geological influence of parent rocks on soil properties in general, including mineral properties in particular, and the limited studies that have dealt with This influence on the mineral properties of the soil. The current study proposed choosing the soil of Sulaymaniyah Governorate as a site for conducting it, as it is a soil characterized by wide variation in its chemical and mineral properties. The most important fertile agricultural plain (Bazian Plain) was chosen.

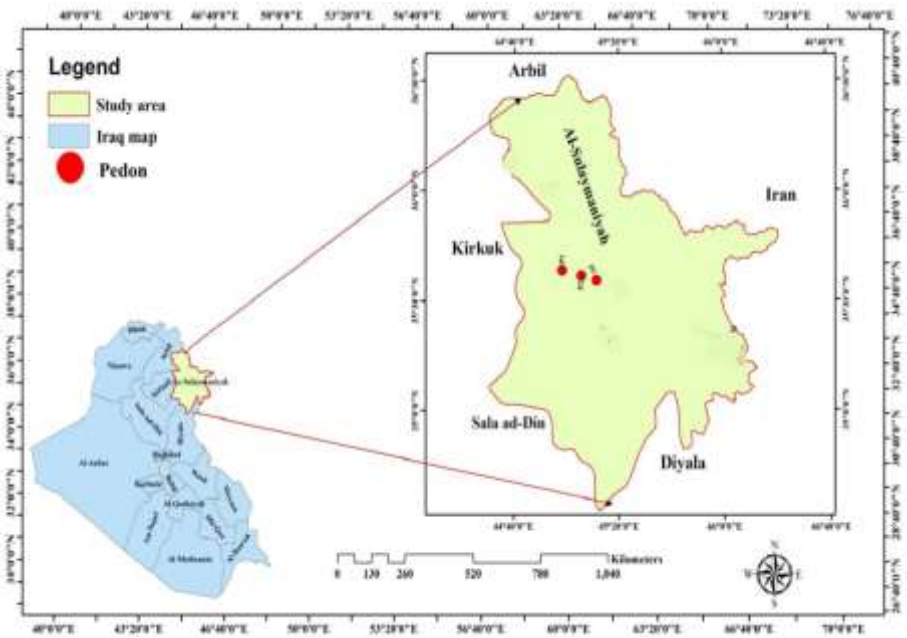
2. Materials and methods of work

Select the study area

The studied area is located in northeastern Iraq in the Sulaymaniyah Governorate, which is about 355 km from the capital, Baghdad, and is located between longitudes (45°26'.02) and (45°34'38) east and latitudes (35°33'07). And (35°55'19) north, and in this location, it is close to the edge of the range of high convolutions in an unstable platform. The study area is characterized by topographic diversity, as there are slopes in different directions and angles dating back to the Fatah and Angina formations, in the middle of which there are spacious plains surrounded by several Mountain ranges: the Hiybat Sultan Mountain Range in the north, the Qara dagh Mountain Range in the southwest, the Horman Mountain Range in the east, and the Bazian Mountains in the west. A study path was determined for the study area, as it is located within the Bazian Plain and extends from the Bazian Highlands in the west to the Taslujah Highlands in the east. It includes three pedons (Bazian, Tainl, and Taslujah), (table 1). Which are formed from rocks of limestone, limestone and Maral, respectively. The pedons of the study area vary from Where the physiographic location is, the height of the Pedon Bazian site ranges about (988 m) above sea level, in front of the Pedon Tinal site, its altitude ranges about (828 m) above sea level, while the height of the Pedon Taslujah site ranges about (1020 m) above sea level, (map 1). shows the distribution of sites in the study area.

Table1. The coordinates of transect soil study

Pedon no	The coordinates of transect soil study	Specifications of transect soil study
1	(44°58'27.71) N (35°38'31.39) E	It is located in the foothills of the Bazian mountain range
2	(45° 5'51.20) N (35°37'3.60) E	It is located in the plain area near Tainl
3	(45°11'34.33) N (35°35'48.27) E	It is located in the foothills of the Taslujah mountain range



Map (1) distribution of study pedons sites

Collect soil samples and examining using diffractive X-rays and infrared rays

The 12 soil samples were collected from 3 pedons representing the study areas, then they were air dried, milled, and passed from a sieve with dimeter of (2 mm). And kept in plastic boxes for physical and chemical analyses of the study soil. The clay was separated from the rest of the soil particles, then all binding materials were removed from it, the samples were dried air-wise, and the samples were divided into two parts according to the method given in (Jackson،1979). The dried clay samples were examined using infrared radiation according to the method given in(Marel and Beutelspacher،1976).

3.Results and Discussion

Physical and chemical qualities

The results of Table 2 showed the size distribution of the study's soil separators, as it showed that there is variation in the distribution of these separators within a single Pedon. As the highest value of the clay separation in P1 in the A1 horizon reached 721.0 g kg^{-1} and the lowest value in P3 in the Ck4 horizon reached 168.0 g kg^{-1}. It is noted from the results that the clay separation within the Bazian Pedon dominates and is followed by the silt and sand separation, while The sand section was dominant within Bedoun Taslujah, followed by silt and clay. In general, the clay separator content values increased with the move from the high sites at both ends of Bidoun Bazian and Pedon Taslujah towards the plain area of Tainl. This increase in the clay content values can be explained by the effect of topography and washing factors, which helped move the clay separator particles from the high sites towards the plain areas. . Table 2 shows the values of the degree of interaction of the soils under study. These values ranged between (7.30 - 7.40), where the highest value was observed in the Ck_1 horizon within pedon Tainl, while the lowest value was observed in the A1 horizon within pedons Taslujah. The results showed that the values of the degree of soil interaction Under study, it was neutral, and these results are consistent with what Al-Shammari (2022) reported, who stated that the degree of soil interaction is a clear reflection of the nature of the original generating materials from which those soils were derived and formed, in addition to the influence of some of the prevailing environmental factors in the region, represented by the amount of rainfall. Table 2 indicates the electrical conductivity values for the soils under study, as these values ranged between (0.25-0.65 dS m^{-1}), where the lowest value was in the Ck1 horizon within Pedon Tainl, while the highest value appeared in the A1 horizon in Pedon Bazian. The reason for the decrease in electrical

conductivity values for all soils under study is due to the effect of the content of clay particles, as they were dominant over the rest of the other particles (sand, silt). These results were consistent with most studies in this field, which confirmed that the soils of the northern regions, including Sulaymaniyah Governorate / Iraq It is considered non-saline soil as a result of the continuous washing operations that it is exposed to due to increased rainfall, which often varies in quantity from one place to another in the same area, in addition to the increase in the density of vegetation cover due to the prevailing environmental conditions that encourage the growth of this green cover, as well as the conditions of the area due to the accumulation of organic materials. Which contributed, in one way or another, to the lack of accumulation of salts,

Table 2: Some physical and chemical characteristics of the horizon of pedons soil studied in Sulaymaniyah governorate

location	Horizon	Depth(cm)	sand	silt	clay	pH	EC(1:1) dS m^{-1}	$Caco_3$ Total	o.m	CEC
			gm kg^{-1}							
Bazian	A_1	0-20	63.0	216.0	721.0	7.00	0.65	250	31.70	40.45
	B_t	20-40	59.0	251.0	690.0	7.20	0.29	421	9.00	35.41
	C_k	40-60	64.0	248.0	688.0	7.00	0.27	436	4.80	21.76
Tinal	Ap	0-25	69.0	272.0	654.0	7.00	0.34	225	10.40	39.00
	C_{k1}	25-50	60.0	339.0	601.0	7.40	0.25	254	7.80	32.60
	C_{k2}	50-75	78.0	247.0	675.0	7.00	0.28	219	5.80	32.10
	C_{k3}	75-100	83.0	362.0	555.0	7.80	0.33	205	3.90	31.32
Taslujah	A_1	0-40	550.0	246.0	204.0	7.30	0.36	325	9.80	27.40
	C_{k1}	40-75	515.0	242.0	243.0	7.45	0.60	329	8.90	22.38
	C_{k2}	75-110	467.0	151.0	382.0	7.65	0.42	337	5.00	22.51
	C_{k3}	110-140	591.0	225.0	184.0	7.97	0.32	320	3.10	21.20
	C_{k4}	140-155	574.0	258.0	168.0	7.80	0.41	350	0.60	20.13

Especially in the surface horizons (Sarhat, 2023).

The results of Table 2 showed the values of total carbonate minerals, as they ranged between (219-436 gm kg^{-1}), where the highest value was on the Ck horizon in Pedon Bazian, while the lowest value was on the Ck_2 horizon in Pedon Tainl. It is noticeable from the results that the soils of all study areas have a relatively high content of carbonate minerals. The reason for this may be due to the nature of the calcareous soil materials and their long lifespan, in addition to their increase in quantity with increasing soil depth, which confirms the processes of chemical transfer of the component due to the decalcification process. The results of Table 2 showed the organic matter content of the study soil. The organic matter content ranged between (0.60-31.70 gm kg^{-1}), with the highest value reaching A_1 in Pedon Bazian, while the lowest value was Ck_4 in Pedon Taslujah. It is noticeable from the results that the amount of organic matter increased in all study soil sites. The upper horizons recorded an increase in their content over the lower horizons, that is, their quantity decreased with increasing depth as a result of the availability of their sources near the surface of the soil, such as natural

permanent and seasonal vegetation, which has shallow roots that may not deepen far from the soil. The surface horizon of the soil, as well as the organic wastes and the plant and animal wastes added to them, as well as the decrease in temperatures throughout the year, which contributed to the decrease in the oxidation rates of organic materials and then their accumulation in the upper horizons of the soil surface, as the variation occurring in the total content of organic materials in Soils with increasing depth may be attributed to the variation in the occurrence of pedogenic processes responsible for their decomposition and movement and then their transfer between different soil horizons. It is clear from the results in Table (2) that the values of the exchange capacity of positive ions in the study soil ranged (20.13 - 40.05 cmmol charge kg^{-1}), as the lowest value was reached at the Ck4 horizon within Pedon Taslujah, and the highest value was reached at the A1 horizon within Pedon Bazian. It is noticeable There is a noticeable decrease in their values in Pedon Taslujah compared to Pedon Bazian and Tainl, due to there being a noticeable increase in the sand separation and the dominance of clay minerals with low exchange capacity, which is the mineral palygroskite.

Diffraction x-ray

The results of Figure (1) for horizon C from Pedon Bazian site, showed the presence of diffraction (14.07 A^0) within the magnesium saturation and air-dry treatment, with its continued presence with its third diffraction (4.71 A^0) in all treatments, which confirms the presence of the true heat-resistant chlorite mineral in the clays of the horizon soil. C within Pedons is the site of Bazian. Mica minerals were also identified through the appearance of diffraction (10.39 A^0) within the magnesium saturation and air-drying treatment, with its continued presence in all treatments, and the appearance of its second diffraction at the basal distance (4.94 A^0) with a weak intensity confirms the presence of three-octahedral mica minerals (biotite) in clays. The aforementioned horizon. The results of the examination in Figure (1) also showed the presence of diffraction (10.52 A^0), which was accompanied by its second diffraction at the basal distance (6.28 A^0), with their continued presence in all treatments, which confirms the presence of palygroskite mineral in the examined sample. The results of Figure (1) also showed the presence of some interstratified minerals of both regular and irregular types, as the diffraction (12.18 A^0) was found within the magnesium saturation and air-drying treatment, which represents the irregular interstratified mineral (mica-chlorite) (Al-Jaff, 2006, AL-jaff & Essa,2020), while The results showed the presence of diffraction (19.95 A^0), which represents the first diffraction of the regular applied mineral (mica-ilite). These results are consistent with what was obtained (Shahd, 2021), as he identified the applied mineral (mica-ilite) at the basal distance (=20 A^0) during his study. For some soils of the Middle Euphrates region. Kaolinite mineral was also identified through the appearance of diffraction (7.03 A^0) during the air-dried magnesium saturation treatment, the ethylene glycol saturation treatment, and the potassium saturation treatment heated to a temperature of 350°C.

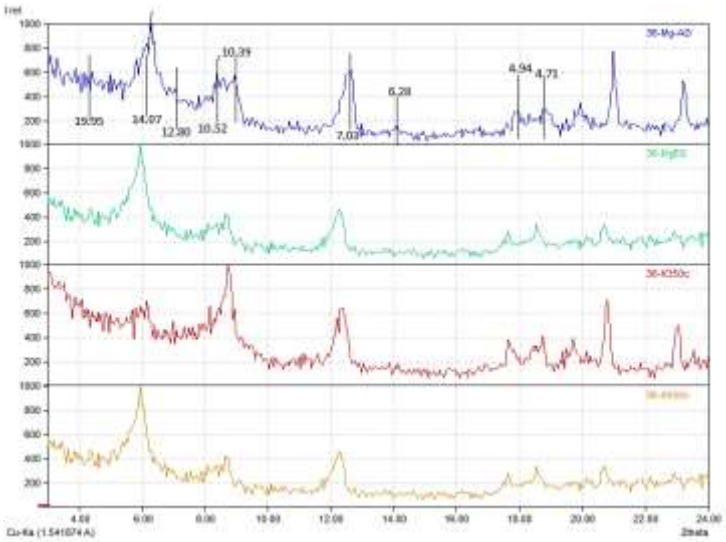


Figure (1) of diffractive X-rays of the Bazian horizon Ck The results of Figure (2) for horizon AP from Pedon Tainl the location of this site, showed that diffraction (14.14 A^0) appears under the air-dry magnesium saturation treatment. The ethylene glycol saturation treatment led to an expansion of the basal distance of the aforementioned diffraction to reach (16.06 A^0), while it decreased. Its basal distance reached (14.14 A^0) within the two treatments saturated with potassium and heated to two temperatures of 350 and 550 C, which confirms the presence of smectite minerals in the surface horizon (Ap) clays of the Pedon site of Tainl. As the results of Figure (2) showed, the continued presence of the diffraction (14.14 A^0) and its third diffraction (4.78 A^0) in all the transactions proves the existence of the heat-resistant mineral Real Chlorite (Al-Shammari, 2020, Al-Khalil, 2020, Al-Shammari, 2021, Abdullah & Esmail,2020). Mica minerals were identified in the model of the clays of the aforementioned horizon through the appearance of diffraction (10.65 A^0) in all parameters, which was accompanied by the appearance of its second diffraction with a weak intensity at the basal distance (4.99 A^0), confirming the presence of tri-octahedral minerals (biotite) in the clays of that horizon (Figure2) While the diffractions (11.05 A^0) and (13.39 A^0) appeared with different

intensities within the distance between the diffractions (10.65 A^0) and the diffractions (14.14 A^0), which represent unregular interstratified layered minerals (mica-smectite), thus confirming that there is a transformation of minerals. Mica in the direction of minerals expanding 2:1 due to the influence of continuous weathering processes, which was most likely transported from the high sites (Bazian, Taslujah) towards the plain area at the Tainl site, and these results are consistent with what was found by (Al-Jaff, 2006) when he studied the minerals applied in Iraqi soils. As the results of Figure (2) showed, the appearance of diffraction (24.54 A^0) within the magnesium saturation and air-dry treatment, with its continued presence in all treatments confirms the presence of the uniform, layered mineral (mica-chlorite) (Essa, 2022). The kaolinite mineral was identified in the clays of the aforementioned horizon through the presence of diffraction (7.16 A^0) within the treatments of saturation with magnesium, air-dried, saturation with ethylene glycol, and saturation with potassium and heated to a temperature of 350 C. Then the treatment of saturation with potassium and heated to a temperature of 550 C led to the disappearance of the aforementioned diffraction. (Dixon et al., 1977).

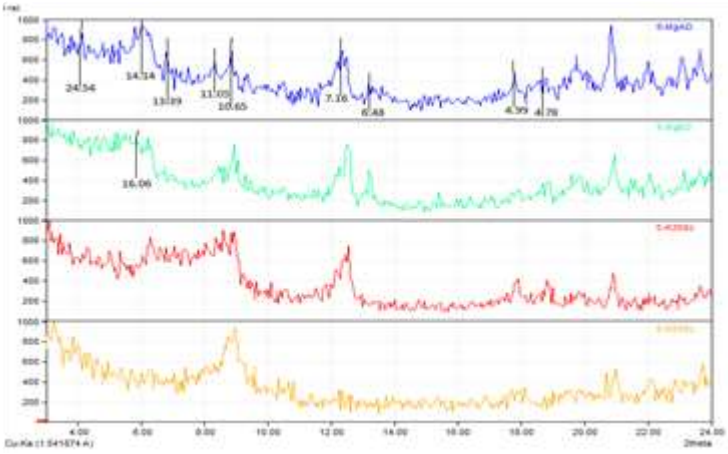


Figure (2) of diffractive X-rays of the Tinal horizon AP

The results of Figure (3) for horizon C from Pedon Taslujah site, showed the presence of diffraction (144.30 A^0) within the air-dry magnesium saturation treatment, which the ethylene glycol saturation treatment led to its basal distance widening to reach (17.06 A^0), to return to that basal distance (10.80 A^0) in two treatments saturated with potassium and heated to two temperatures of 350°C and 550°C, thereby confirming the presence of smectite minerals in the clays of the aforementioned horizon. As the results of Figure (3) showed, the continued presence of diffraction (14.30 A^0) in all parameters, which was accompanied by its third diffraction at the basal distance (4.70 A^0), which confirms the presence of the true heat-resistant mineral chlorite in the clays of this horizon. Mica minerals were identified in the horizon C clays from Bedoun, the Taslujah site

(Figure3) through the presence of diffraction (10.80 A^0) in all parameters, which was accompanied by a second diffraction with moderate intensity at the basal distance (5.15 A^0), thus confirming the presence of mica minerals of both types, three-Octahedra (biotite) and Octahedra (muscovite). The appearance of diffractions (11.11 A^0) and diffractions (13.85 A^0) within the space between the two diffractions (10.80 A^0) and (14.30 A^0) represent irregularly applied minerals (mica-smectite) in different stages of weathering (Al-Jaff, 2006, AL-Hazaa, 2018). The appearance of diffraction (24.18 A^0) within the air-dry magnesium saturation treatment, and its continued presence in all treatments, confirms the presence of the regular, layered mineral (mica-chlorite) from the aforementioned horizon clay model. As shown in the results of Figure (3), the kaolinite mineral was diagnosed through the appearance of diffraction (7.49 A^0) in the treatments saturated with magnesium and air-dried, saturated with ethylene glycol, and saturated with potassium and heated to a temperature of 350°C, and then its disappearance within the treatments saturated with potassium and heated to a temperature of 550°C.

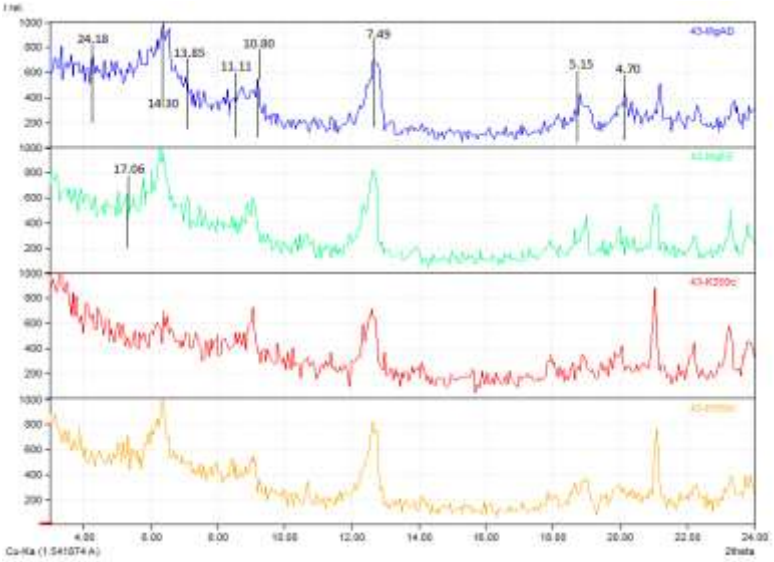


Figure (3) of diffractive X-rays of the Taslujah horizon Ck_4 location In general, the results of the X-Ray examinations in the figures (1،2،3) of the clays of the horizons A and C of the soil pedons (Bazian, Tainl, and Taslujah) showed the dominance of the clay minerals: chlorite > smectite > mica > applied minerals > kaolinites. The predominance of the minerals chlorite, smectite, and mica in the clays of these soils is mainly due to the influence of their parent material (limestone, limestone,maral), especially within pedons, the high areas at both ends of the aforementioned study line (Taslujah, Bazian), whose parent material Consisted of rocks. (Limestone and limestone-Maral) respectively. Many studies (Murakani et al., 1999, Townley et al., 2007, Vidal et al., 2016, Li et al., 2022) have shown that the phenomenon of hydrothermal alteration of limestone rocks is a common occurrence, which results in the formation of new minerals, most of which are chlorite, smectite, and mica. While (Li et al., 2022) showed that chlorite has many sources, being one of the common minerals found in different geological environments, and that one of the sources of chlorite is the hydrothermal transformation of limestone rocks, and that the chemical composition of the formed chlorite varies depending on the environmental conditions that depend on each of Temperatures, pressure, and composition of the host rock and solutions (Vidal et al., 2016). In light of these assumptions, we see, according to our belief, that the chlorite formed in the soil of the first academic year (Bazian, Tinal, and Taslujah) has an internal hydroxide layer of the brucite type Mg-hydroxyl interlayer, since the limestone core in the source materials of those soils consists mainly of calcium carbonate Ca. -Carbonate and Mg-Carbonate, which during their transformation will be reflected in the chemical composition of the formed chlorite (Townley et al., 2007), and this will be proven in infrared (IR) examinations later. As for the soil of Pedon the plain area (Tainl), its mineral content is affected by the mineral composition of the highlands (Taslujah, Bazian), which is due to the fact that

it is more influenced by the rock fragments and clay transported to it from the Taslujah highlands compared to the Bazian highlands, and this is due to the topography of those areas. The Taslujah Highlands series is the highest location compared to the Taslujah and Bazian sites, as it was noted that the dominance of smectite minerals and minerals applied in the soil clays of the Taslujah site, as these minerals are transported with the clays transported from the Taslujah Heights towards the plain area.

Infrared Ray (IR)

The results of Figure (4) of infrared examinations of clay separators within horizon C of Pedon Bazian site, showed that the appearance of absorption spectrum bands at frequencies 3618.21, 3341.06, and 649.97 cm^{-1}, which confirms the presence of chlorite mineral in the clays of the aforementioned horizon, as shown by (Yang et al,2018) The appearance of spectrum bands at frequencies 3541.06 cm^{-1}, 640, and 660 cm^{-1} confirms the presence of an internal hydroxide layer within clay minerals 2.1, while (Shirazu, 1980 and Nayak and Sigh, 2007) indicated that the appearance of a band The spectrum at the range less than 650 cm^{-1} confirms that the inner hydroxide layer is of the two-octahedral type (gibbsite). As the results of Figure (4) showed, there are absorption spectrum bands at frequencies 3618.21, 3429.20, 1029.92, 798.47, 526.53, and 418.52 cm^{-1}, which indicate The presence of mica minerals in the clays of the aforementioned horizon, and these results were consistent with what was found by (Al-Fatlawi, 2016) when she studied some Iraqi soils. As for the mineral palechrosite, it was identified in the clays of the C horizon within Pedon Bazian site, through the appearance of absorption spectrum bands at frequencies 3618.21 and 918.12 cm^{-1} As (Frost et al., 2001) showed that the absorption spectrum band of the mineral palechrosite appears at the range 3615 cm-1, and the mineral palechrosite is tri-octahedral when the spectrum band appears at the range = 913 cm^{-1}.

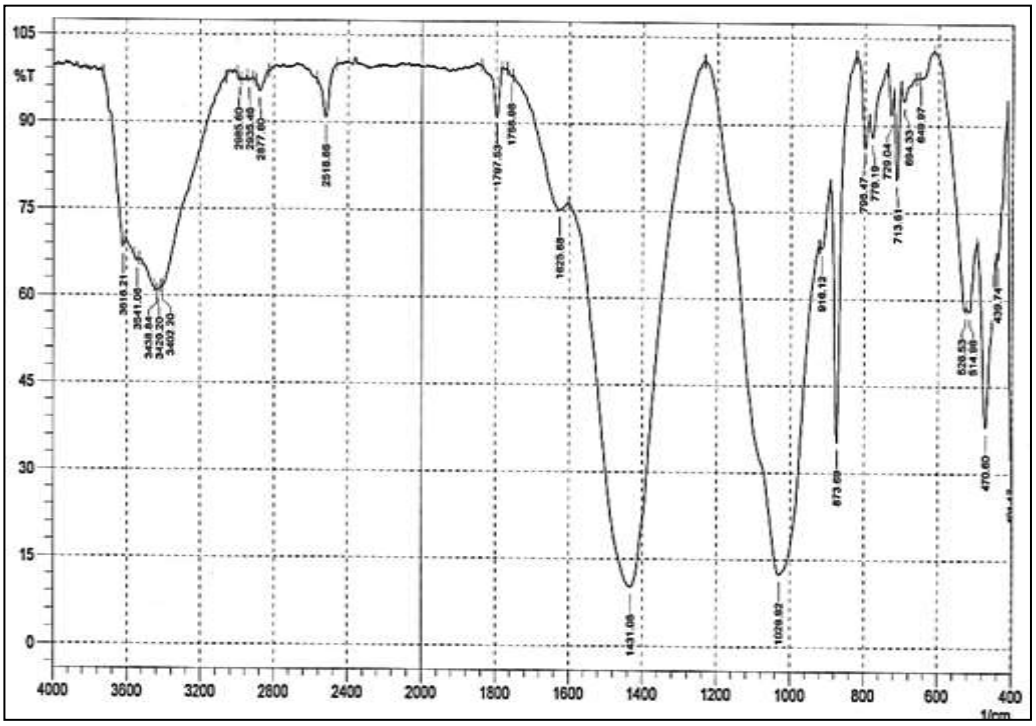


Figure (4) of Infrared Ray of the Bazian horizon Ck

The results of Figure (5) for horizon A from Pedon Tinal, showed the presence of absorption spectrum bands at frequencies 3620.14 and 3427.27 cm^{-1}, strong diffraction at frequency 1022.80 cm^{-1}, and weak diffraction at frequency 875.62 cm^{-1}, which all confirm the presence of minerals. Smectite in horizon clays (Khang et al., 2016), while the mineral chlorite was identified through the

presence of absorption spectrum bands at frequencies 3620.14, 3544.92, and 646.11 cm^{-1} (Yang et al., 2018), and the appearance of absorption spectrum bands at frequencies 3544.92, 646.11 cm^{-1}. 1, confirms that there is an internal hydroxide layer within the 2:1 composition of expanded clay minerals, while (Nayak and Sing, 2007) indicated that the appearance of the absorption spectrum band at the frequency of 646.11 cm^{-1} confirms that the internal hydroxide layer within the chlorite mineral is of the brucite type. Brucite-$Mg_3(OH)_6$. As the results of Figure (5) showed, there are absorption spectrum bands at frequencies 3620.14 cm-1, 3427.27 cm^{-1}, 1022.20, 796.55, and 430.10 cm^{-1}, which indicate the presence of mica minerals in the clays of Horizon A. Within Pedon is the site of Tinal, and these results are consistent with what was found by both (Al-Watifi, 2012 and Al-Fatlawi, 2016) when they studied some Iraqi soils. In addition, the variation in the intensity and values of these bands is due to the diversity and presence of mica minerals in different stages of weathering. As shown in the results of Figure (5), the appearance of the absorption spectrum band at the frequency 430.10 cm^{-1} confirms the presence of three-octahedral mica minerals (biotite) in the clays of the aforementioned horizon (Dixon et al., 1977). The results of Figure (5) showed the presence of absorption spectrum bands at frequencies 3620.14 cm^{-1} and 3427.27 cm^{-1}, which confirm the presence of the mineral palechrosite in the spectra of the aforementioned horizon. (Frost et al., 2001) showed that the absorption spectrum bands of the mineral palechrosite appear at frequencies 3618.21, 3431.13, and 913 cm^{-1}. He added that the non-appearance of the spectrum band 913 cm^{-1} in some cases confirms that the mineral palechrosite is of the three-octahedral type, and these results were in agreement. With what was obtained by studies (Al-Watifi, 2012 and Al-Fatlawi, 2016), which were conducted on Iraqi soil. As the results of Figure (5) showed, the presence of absorption spectrum bands at frequencies 3620.14 cm^{-1}, and strong diffraction at frequencies 1022.20 cm^{-1},692.40 cm^{-1}, 430.10 cm^{-1} and belongs to the layered mineral (mica-smectite), while the absorption spectrum bands located within the range 875.62-1269.07 cm^{-1} and represented by a high-intensity and wide band are representative of the state of formation of the layered mineral, as (Inoue, 1989) stated that one of the most prominent The characteristics of the interstratification state are the appearance of a shoulder at the left edge of the broad band 1022.20 cm^{-1} at a frequency close to 875.60 cm-1, which indicates a high percentage of the contribution of smectite minerals (>30%) within the composition of the interstratification mineral (mica-smectite).

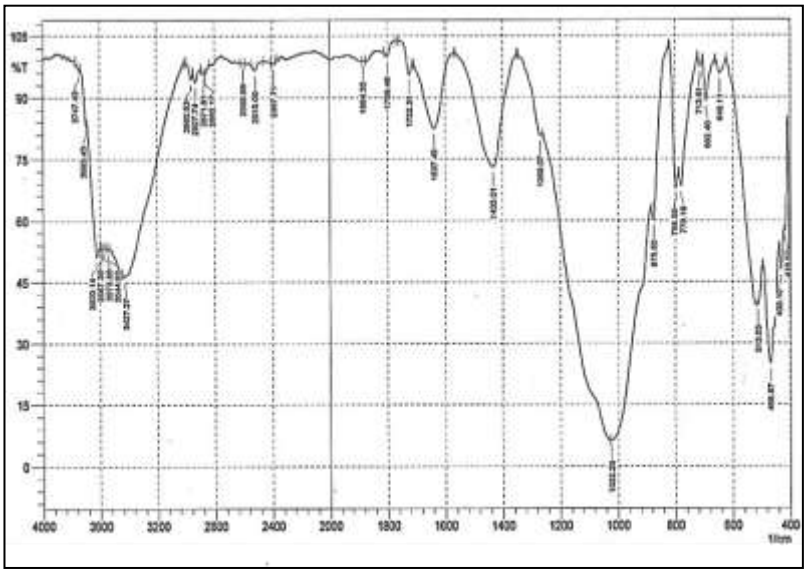


Figure (5) of Infrared Ray of the Tinal horizon AP

The results of Figure (6) of infrared examinations of the clay separation of the Ap horizon from pedon Taslujah site, showed the presence of absorption spectrum bands at frequencies 3622.07 and 3404.13 cm^{-1}, and strong diffraction at frequency 1016.42 cm^{-1}, accompanied by weak diffraction at frequencies 779.19 - 873.69 cm^{-1}. 1, which all confirm the presence of smectite minerals in the clays of the aforementioned horizon (Khang, 2016). As the results of Figure (6) showed, the mineral

chlorite was identified in the clays of the AP horizon from Pedon, the Taslujah site, through the appearance of absorption spectrum bands at frequencies 3622.07, 694.33, and 516.89. 464.81 cm^{-1} (Nayak and Singh, 2007), and the presence of the spectrum band at frequency 694.33 cm^{-1}, which belongs to the mg3-$(OH)_6$ group, indicates that the inner hydroxide layer within the inner layers of the chlorite mineral is of the three-octahedral type (Brucite (Sorna et al., 1977). Mica minerals were also identified in the clays of the aforementioned horizon (Figure6) through the appearance of the absorption spectrum band at frequencies 3622.07, 1016.42, 798.47, and 424.31 cm^{-1} (Al-Watifi, 2012).

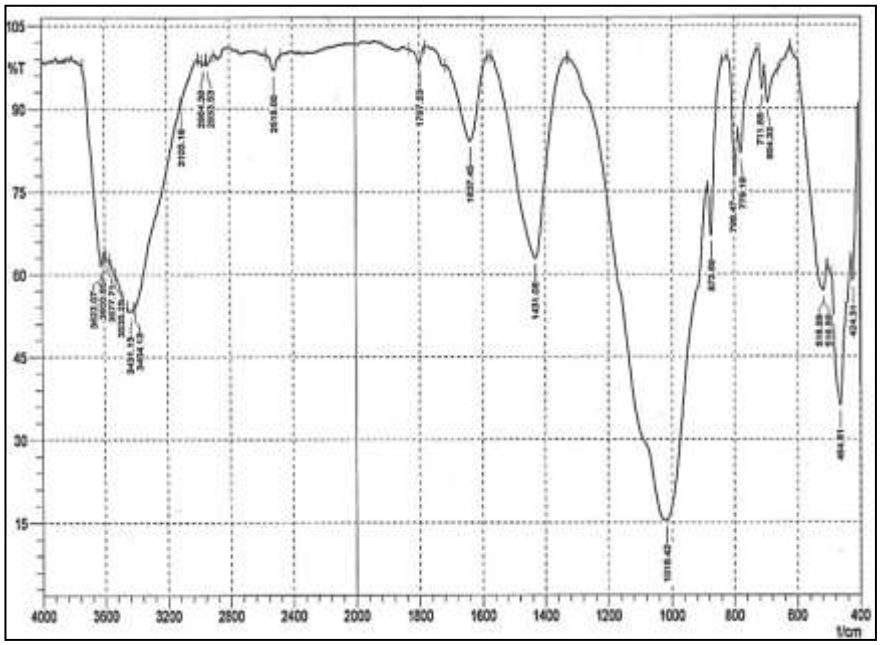


Figure (**6**) of Infrared Ray of the Taslujah horizon Ck_4 location

Conclusion

In general, the results of the X-Ray ،IR examinations of the clays of the horizons A and C of the soil pedons of (Bazian, Tainl, and Taslujah) showed the dominance of the clay minerals: chlorite > smectite > mica > applied minerals > kaolinites. The predominance of the minerals chlorite, smectite, and mica in the clays of these soils is mainly due to the influence of their parent material (limestone, limestone, Maral), especially within pedons, the high areas at both ends of the aforementioned study line (Taslujah, Bazian), whose parent material Consisted of rocks. (Limestone and limestone-Maral) respectively. As for the soil of Pedon the plain area (Tainl), its mineral content is affected by the mineral composition of the highlands (Taslujah, Bazian), which is due to the fact that it is More influenced by the rock fragments and clay transported to it from the Taslujah highlands compared to the Bazian highlands, and this is due to the topography of those areas. The Taslujah Highlands series is the highest location compared to the Taslujah and Bazian sites, as it was noted that the dominance of smectite minerals and minerals applied in the soil clays of the Taslujah site, as these minerals are transported with the clays transported from the Taslujah Heights towards the plain area.

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