ENGINEERING GEOLOGY

PROF DEBASIS ROY
DEPARTMENT OF CIVIL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY, Kharagpur

LECTURE – 10
Igneous Rocks

Hello everyone and welcome back. Today's lesson will be on igneous rock that means the rock that actually develops from volcanic activities. We are going to look at the processes involved in the formation of these rocks and what are the engineering uses or what kind of problems you might actually have to expect when you are involved within engineering geology project in igneous rock terrain. Before we do that, we are going to examine the question set that was given to you when we met last time.

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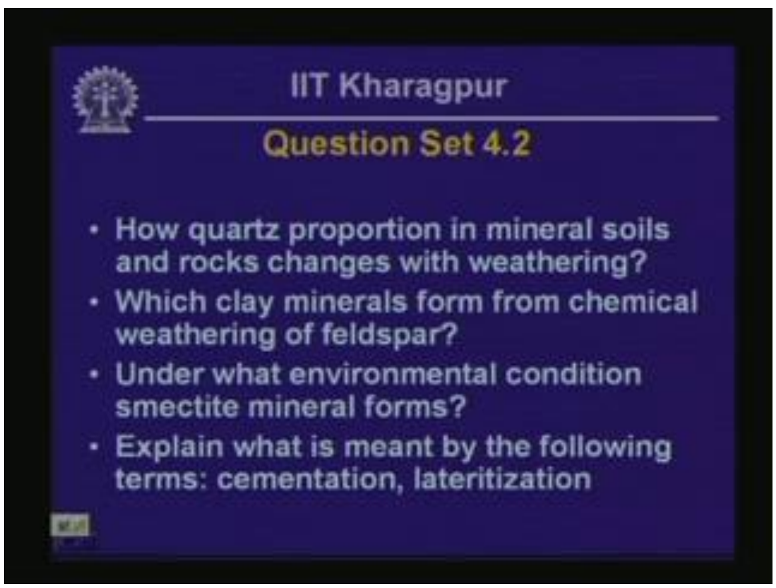

The first question that was asked was; how quartz proportion in mineral soils and rocks changes with weathering? Now, as this soil weathers, the proportion of quartz increases because quartz inherently is not very much susceptible to weathering. So, whatever quartz proportion was there in the parent material more or less continues through the weathering process. In addition to it because of chemical weathering, from chemical weathering of parent rock mass, more quartz crystals will form and precipitate out and as a result the percentage of quartz is expected to increase as the weathering process matures.

Now, an interesting snippet on this issue is that if you consider the rocks of extra terrestrial origin in other planets and moon, those rocks are not particularly rich in quartz unlike the rocks that are available at the surface of the earth; that is because chemical weathering process is not, it is less, it has got a less influence on the rock mass in those planets because of absence of water and oxygen in those environments.

The second question that was asked was which clay mineral forms from chemical weathering of feldspar? We looked at one of the examples of chemical reactions in the last lesson and that was the chemical weathering of potassium feldspar and in that I indicated that clay mineral called kaolinites forms from that weathering process.

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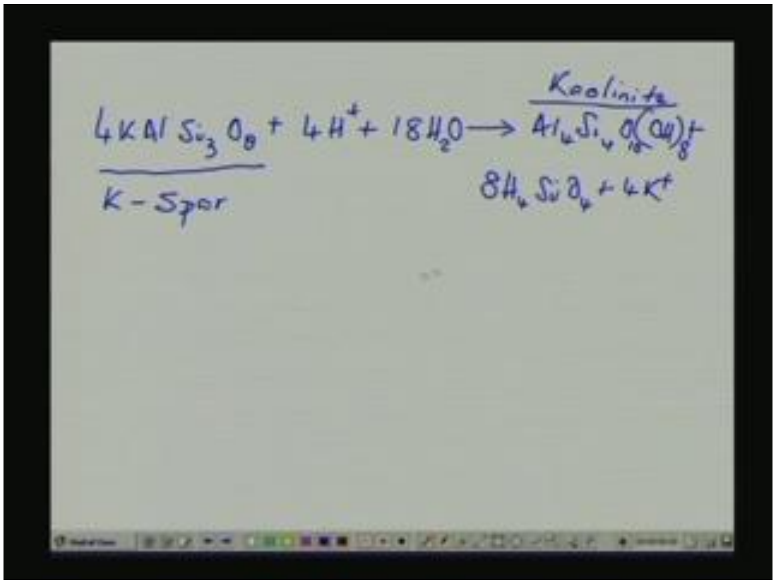

And, if you recall the reaction that we considered then, was this one; what we had there was potassium alumino silicate, that was the parent material and that was acted upon by water in acidic environment and what we ended up with is O_{10}, actually O_{10} and $(OH)_8$ and in addition to that we are going to have some silicic acid and some release of potassium ion. Now, this one here was potassium feldspar, also sometimes called k-spar and the weathering product was a clay mineral called kaolinite.

We continued with this weathering process in the last lesson and we showed that further leaching of kaolinite would eventually end up with formation of Gibbsite material. Now, this is one of the processes; in addition to it what we have is Plagioclase feldspar which is essentially sodium, calcium, alumino silicate of sodium and calcium, sodium, calcium and aluminum; that also with carbonation and hydrolysis ends up in formation of kaolinite. This was not discussed in the previous lesson.

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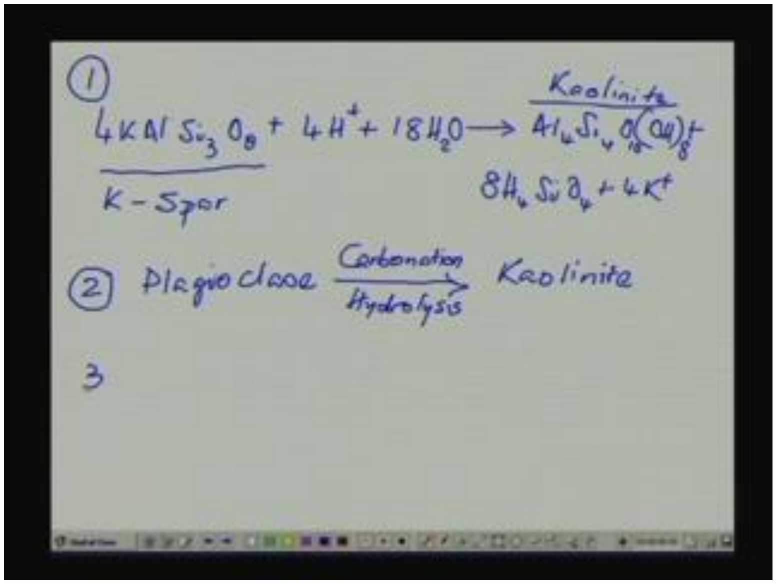

In addition to it pyroxene mineral, amphiboles and biotite upon hydrolysis, ends up into formation of chlorite, mineral called chlorite and then that chlorite mineral upon chemical weathering leads to the formation of kaolinite.

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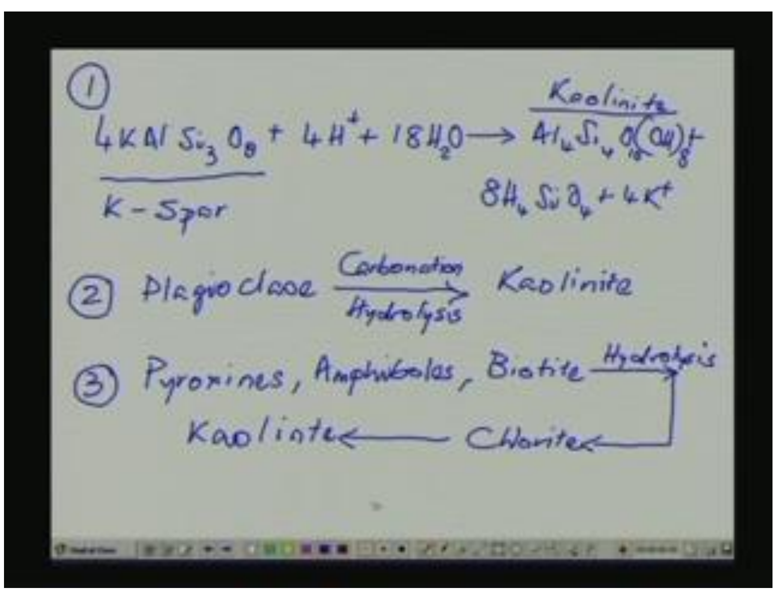

So, these are three of the principle chemical weathering processes involved in the development of kaolinite deposits, kaolinite clay deposits. So, that takes care of the second question.

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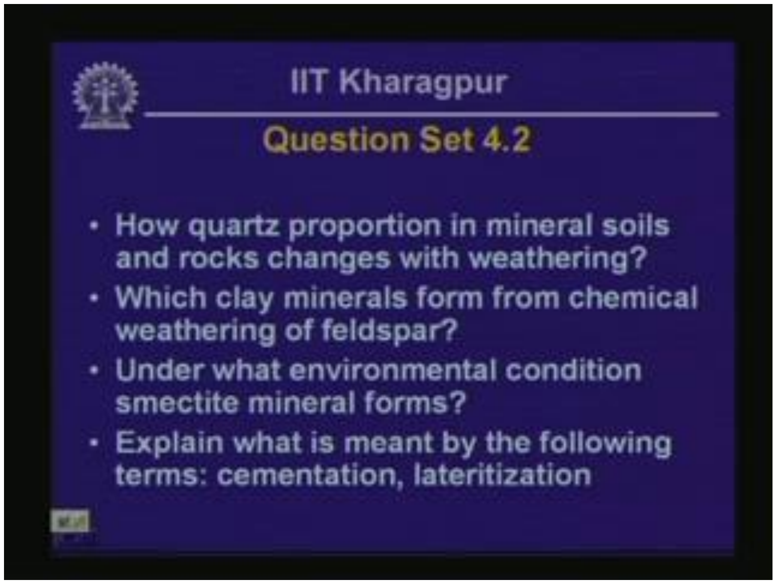

Then third question which was asked was under what environmental conditions Smectite mineral forms? If you recall, I indicated in the last lesson itself that Smectite minerals forms basically in arid environment where water is not abundant.

Now, you should not expect though that smectite minerals only occur in water deficient environments because Smectite mineral can get transported by transportation agents like water or ocean waves and they might get deposited in water rich environment and form a large mass of Smectite body because if the deposition process far exceeds the process in which Smectite mineral weathers into other types of, other types of clay and non-clay minerals.

So basically, for formation of Smectite mineral, you need an arid environment but it may exist actually in situations where the environment is not water deficient and in fact, the large area underneath the central Indian Ocean, you get Smectite material under sea, within the undersea sediments.

Now, the fourth question that I asked was that what is meant by cementation and lateralization processes? Cementation process is essentially involved development of chemical bonds in between individual soil particles and in fact, actually we will see in one of the later lessons we will see that similar kind of chemical bonding or cementation will also be involved in the development of many types of sedimentary rocks as well.

Now, what is important in this case is the characteristic of the bonding agent or the cementitious material among which you could have silica cement or you could have simple deposits of clay minerals or you could have carbonate cement and depending on what kind of cement is acting as bonding agent, the strength of the cementation bond is going to vary over a very wide margin. We will see, we will explore this topic in greater detail in one of the, one of the future lessons.

Then the second question that I asked was what is meant by lateralization and this one was also discussed when I was, when I was talking about the chemical weathering of orthoclase or k-spar and what was given, what was give is essentially a two-step process.

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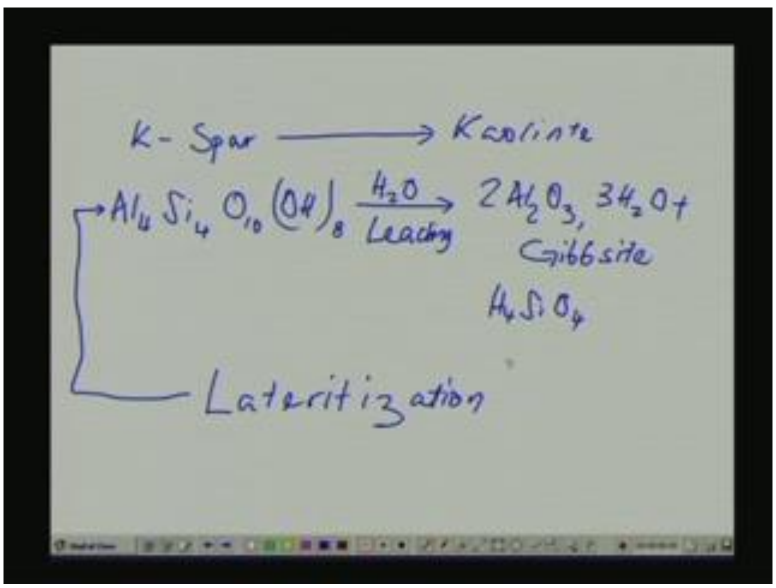

In the first step you have got, you have got kaolinite from k-spar from chemical weathering of k-spar ended up in development of kaolinite and some silicic acid and release of potassium salts. We also looked at this equation just when we were considering the answer of the first or the second question in this question set.

And then, kaolinite may get leached. As I indicated before, it may get leached and basically what you get here is action of H_2O and this is a process called leaching and what you end up with is a tertiary product, tertiary weathering product of this chemical composition, this is called Gibbsite and you also get silicic acid in solution, dissolved silicic acid. Now, this chemical reaction leads to a process called lateralization.

And in fact, you may already know that India is one of the chief source of aluminum ore of this composition and this type of deposit, Gibbsite deposit or bauxite deposit as it is better known as, this type of deposit is formed mainly from the leaching of potassium feldspar; that is one of the chief source of the development of this kind of mineral ore.

So, that takes care of all the questions of the previous question set and now we continue with the subject matter of this particular lesson.

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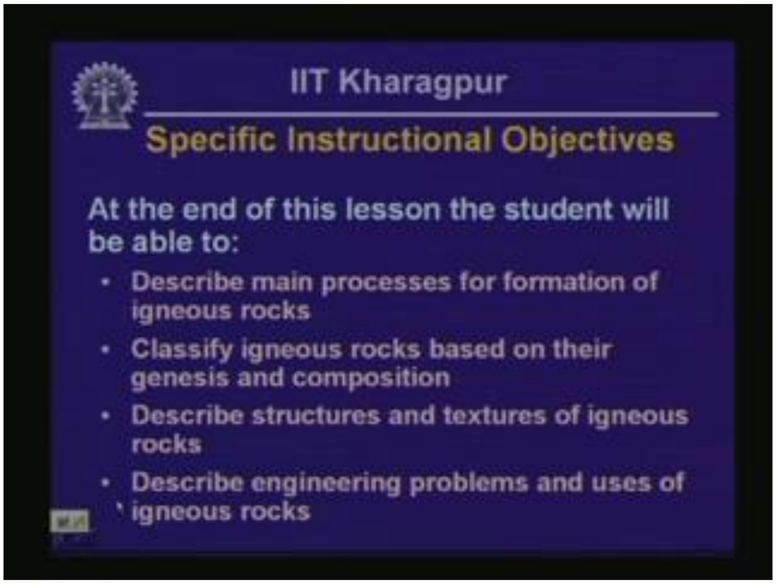

What are the objectives of this lesson? We want to know what are the formation processes of igneous rocks, we want to be able to classify igneous rocks based on their genesis and composition, we want to look at the textures and structures within the igneous rock bodies and finally, we will examine the difficulties or actually resource material that can be available from igneous rock bodies as well as the difficulties of construction or the advantages of different construction projects in igneous rock terrain; these are the objectives of this particular lesson.

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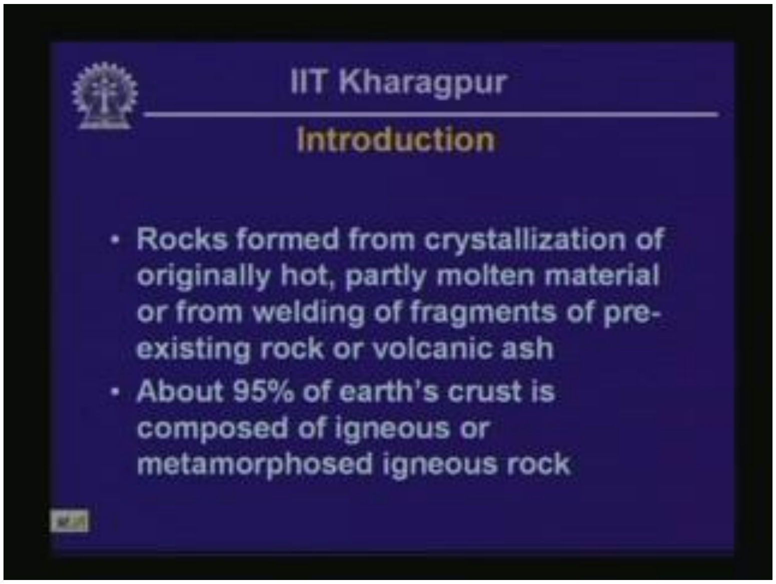

And then, the first thing that comes into mind really is what is meant by igneous rock. Igneous rock is essentially formed from the crystallization of originally, originally hot partially molten rock forming material that is one of the processes and the second thing that also gives rise to the development of igneous rock is welding of, actually heat welding of preexisting rock fragments that is ejected because of volcanic activity and these are the chief formation processes of igneous rocks.

Now, igneous rock is very widely available on the surface of or within the earth's crust and in fact, 95% of the earth's crust is composed of igneous rocks or metamorphosed counterparts of parent igneous rocks. So, it is very widely available, particularly at depths.

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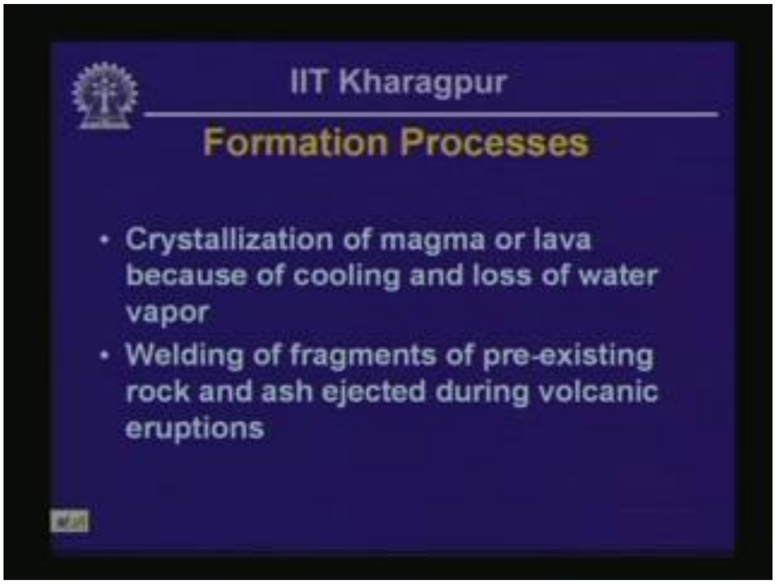

Now, formation process of igneous rocks, I indicated already that the main process, main processes include; crystallization of magma or lava, these are actually partially molten rock forming material. So, magma and lava, they are partially molten material containing rock forming minerals and the difference between and magma and lava is essentially; magma is when the partially molten material remains underground below surface and if it is ejected to the surface because of volcanic activity that is commonly referred to as lava.

Now, crystallization of magma and lava actually gives rise to the formation of volcanic rocks and how crystallization takes place is primarily because of cooling; because of cooling, loss of temperature of magma or lava and the second the second reason for crystallization is loss of water vapour that exists within the body of magma or lava.

Now, how cooling takes place? Cooling takes place as it is very intrutive actually, cooling takes place when magma or lava comes into contact with surrounding cooler rock mass or when it is ejected to the surface and it comes into contact with cooler atmosphere.

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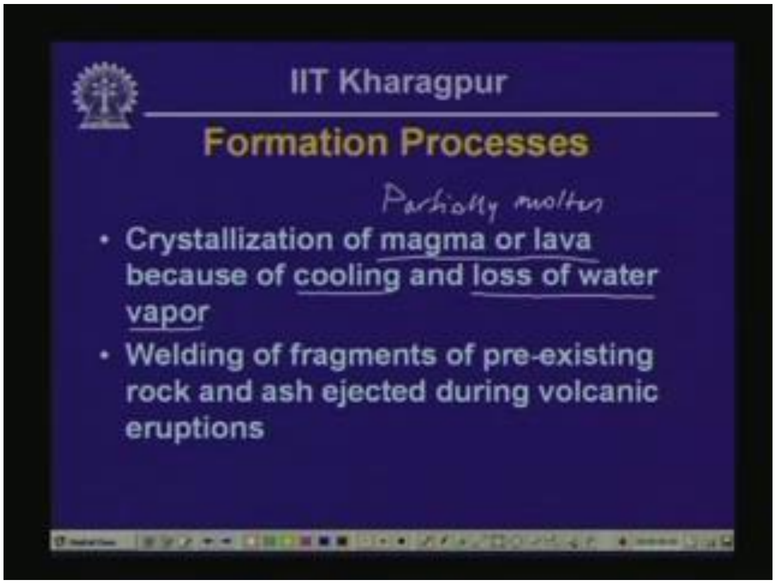

Now, the second process that is involved here is actually welding of fragments of preexisting rock.

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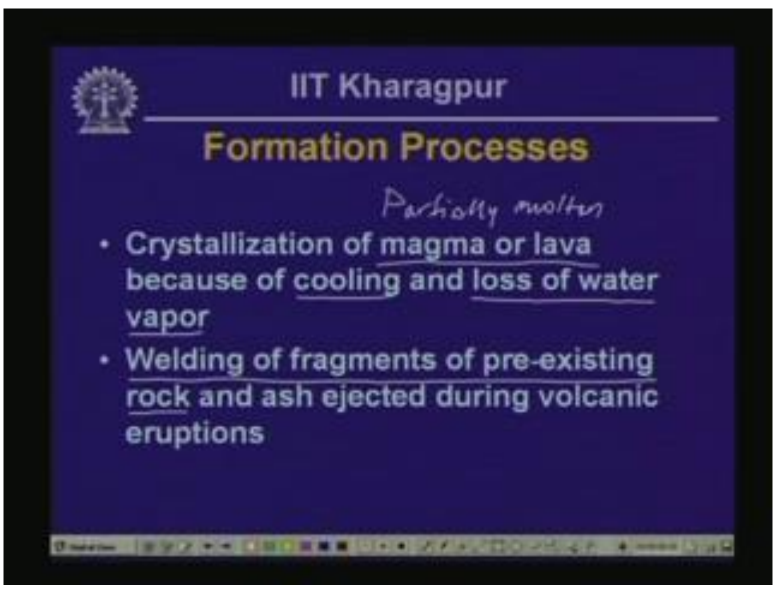

Preexisting rock can be broken into smaller pieces because of volcanic activities and it may get ejected during volcanic activities and the resulting fragments may actually get welded because of the heat of the ejected, heat within the ejected material and the ash that is ejected during volcanic activity can also get welded, heat welded and this also is another source, another process that is involved in the formation of volcanic rocks.

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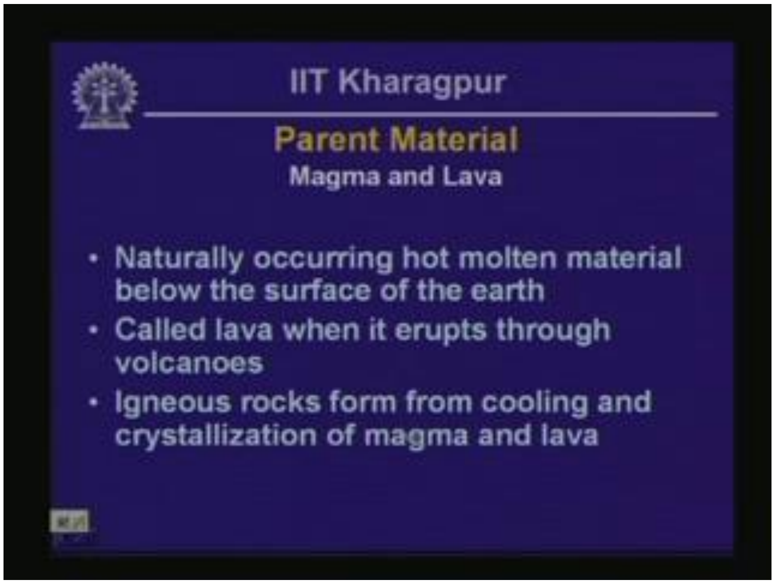

Now, parent material, parent material in this cases, in these cases are basically magma or lava that is the chief source of igneous rocks and I already have indicated that these things are essentially naturally occurring hot partially molten material that exists underground and it is called lava when the material erupts through volcanoes and igneous rock, a large proportion of igneous rock actually forms from cooling and crystallization of magma or lava as I have already indicated.

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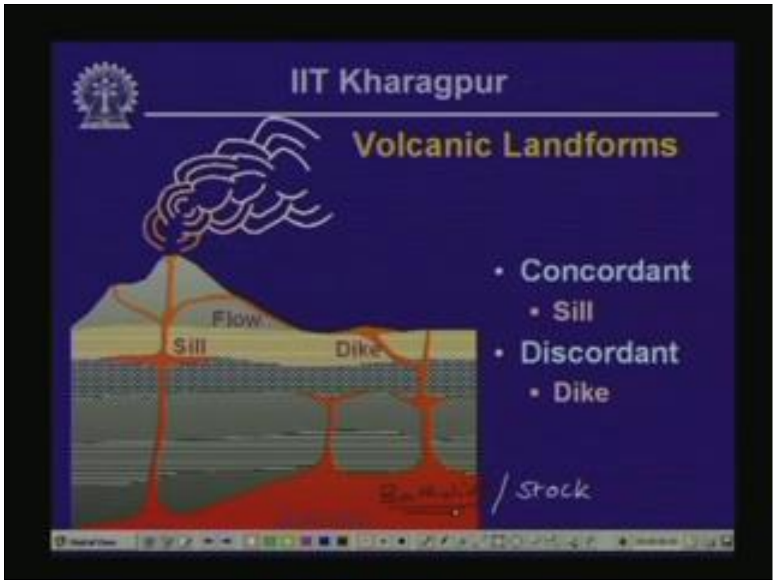

Now, next thing that is important here are what are the typical volcanic landforms which are comprised of igneous rocks? Now, volcanic landforms include, it could include a very large body of partially molten rock forming material underground as I already have indicated and this is given the name of batholith, batholith and if it could be a very large body or it could be a smaller body; in that case, the body is called a stock.

Now, batholith or stock, the partially molten material from batholith or stock could find their way up because of their lighter unit rate in comparison with the surrounding rock mass through the cracks and fishes in between the surrounding, within the body of the surrounding rock mass.

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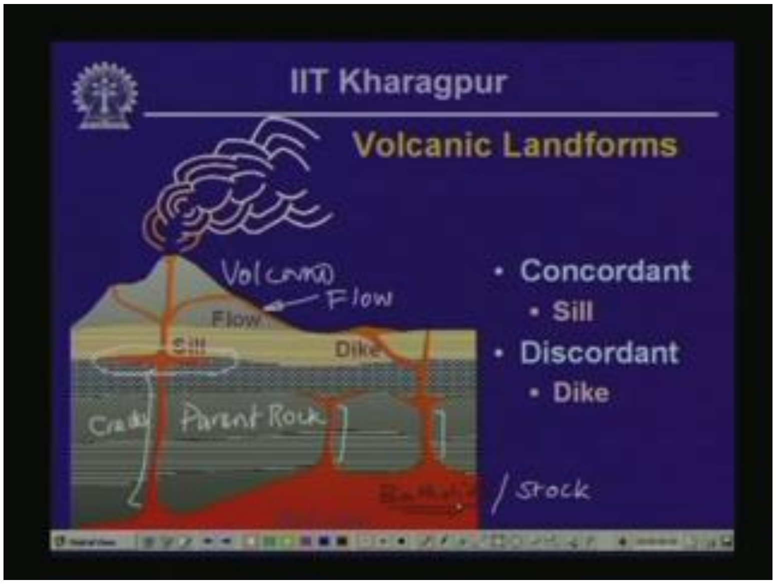

So, these are the parent rock in this case and the cracks and fishes could be here; so these are essentially preexisting cracks, fishes, joints and through those pathways, molten material can find their way up and end up developing bodies like this, they are called sills or they may eventually find their way up to that atmosphere through a volcano or they might actually end up flowing on the ground which is known as lava flow.

An example of lava flow is the Deccan, Deccan trap. You may recall from one of the previous lessons that the large area of the north western peninsular India is actually underlain by a deposit called Deccan trap and that is essentially a lava flow deposit that is essentially comprised of lava flow basalts. You will see, what is meant by that actually as the lesson progresses.

Now, two types of, you need to distinguish between volcanic landforms. There could be concordant landforms or there could be discordant landforms. If the dip of the volcanic body is more or less aligned with the dip of the parent rock; in that case, then in that case, the body is called a concordant body, otherwise it is called a discordant body. Example of concordant, concordant volcanic landform is sill or a dike and example sorry it is sill and the example of a discordant volcanic landform is a dike. It is pretty obvious from the cartoon shown here.

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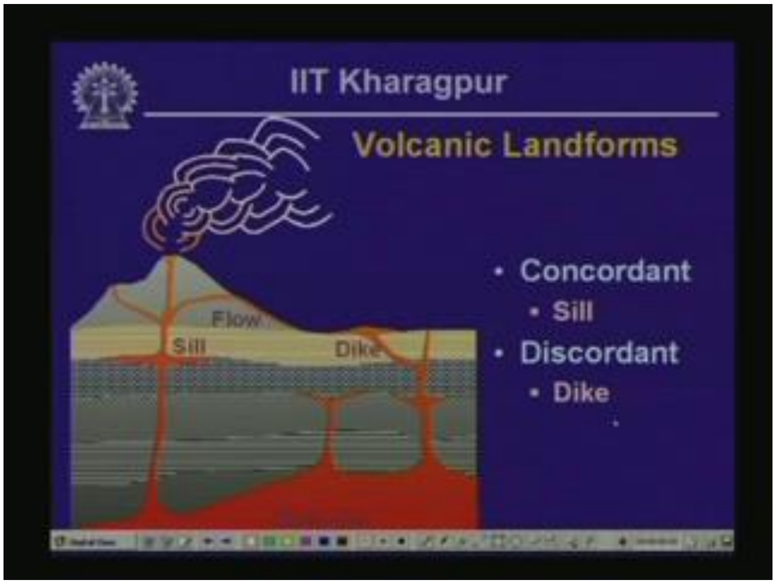

Another type of volcanic landform which is not shown here is it is called laccolith.

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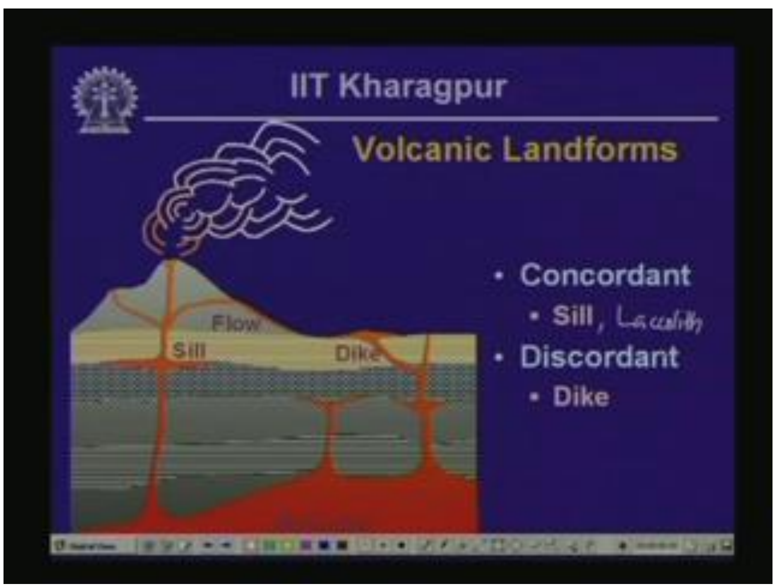

Sometime what happens; when magma actually forms a body like a sill, in that case if the magma is under pressure, then it may lead to the bulging of the overlying rock. If formation of the body leads to the bulging of overlying rock, then the body is not called a sill really, it is called a laccolith.

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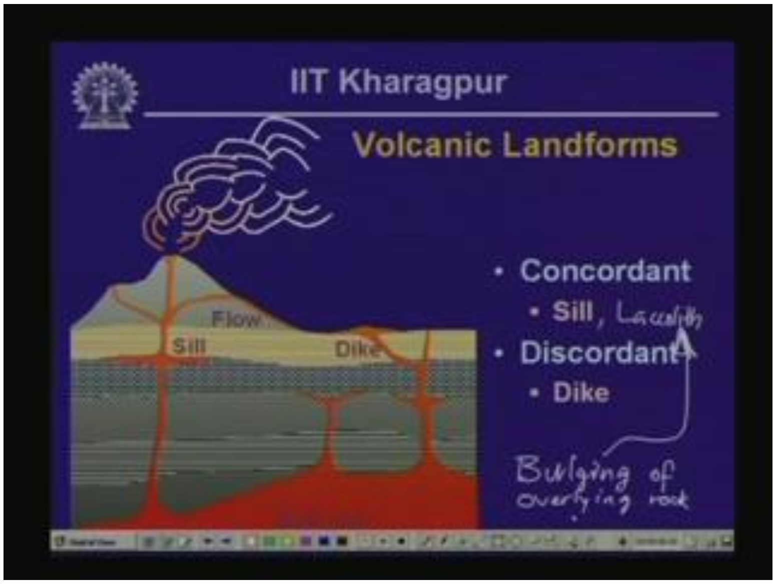

These are typical landforms and then we move on to the characteristics of the rock forming material - magma.

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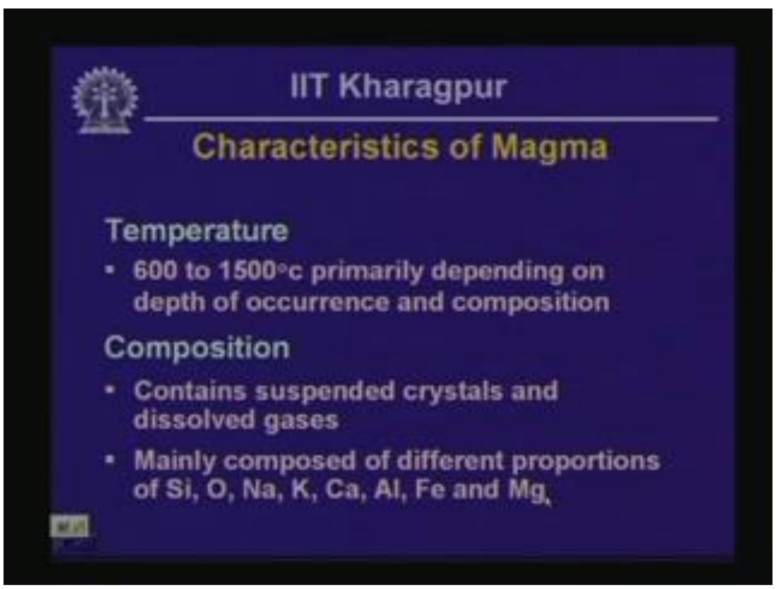

Magma is actually hot partially molten material; it exists at a temperature of between say 600 degrees to about 1500 degrees Celsius. It has I mean, it depends, the temperature really depends on, primarily on what is the mineralogical composition of the magma as well as what is the depth at which the magma is in existence.

Now, the partially molten state arises because the magma contains different species, of different species of chemicals and dissolved gases and because all of this crystal, all of this chemical species have got different thermal behavior or different melting points; as a result, the mixture actually exists in a partially molten state and a magma at different temperatures would have different mineral crystals in suspension, different species of mineral crystals in suspension.

Now, if you look at the mineralogical composition, then you will see that magma is mainly composed of about 7 or 8 minerals, 7 or 8 elements and they are silicon, oxygen, sodium, potassium, calcium aluminum, iron and magnesium. So, these are the major components; they are the major, they form the major proportion of the mass of the molten material, partially molten material.

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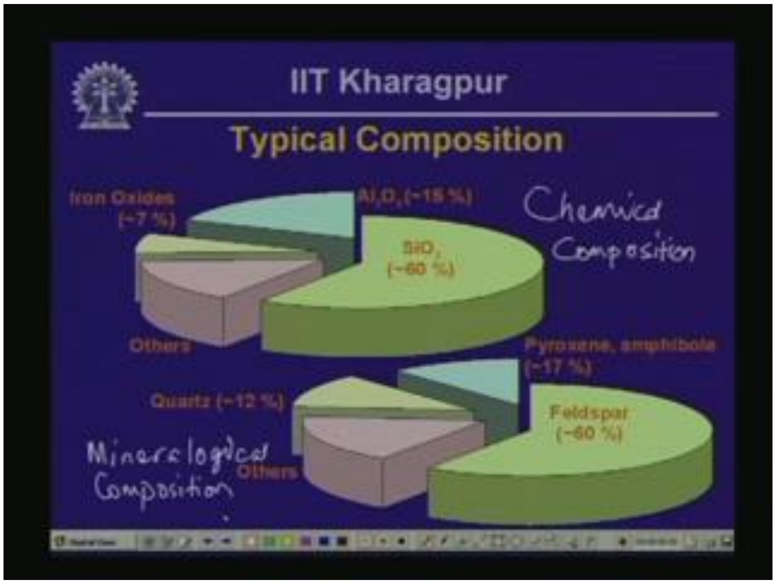

Typical chemical and mineralogical composition of magma is shown on these pie charts. The pie chart on the top that gives you the chemical composition of magma and this one shows the chemical composition of magma and the one below shows the mineralogical composition.

So, you can see that silica forms a very large by far the largest proportion of an average magma and the next in abundance is alumina, next in the abundance, next in the order of abundance is alumina; whereas if you look at the mineralogical composition, then the two chief minerals that exists in magma includes feldspar and quartz.

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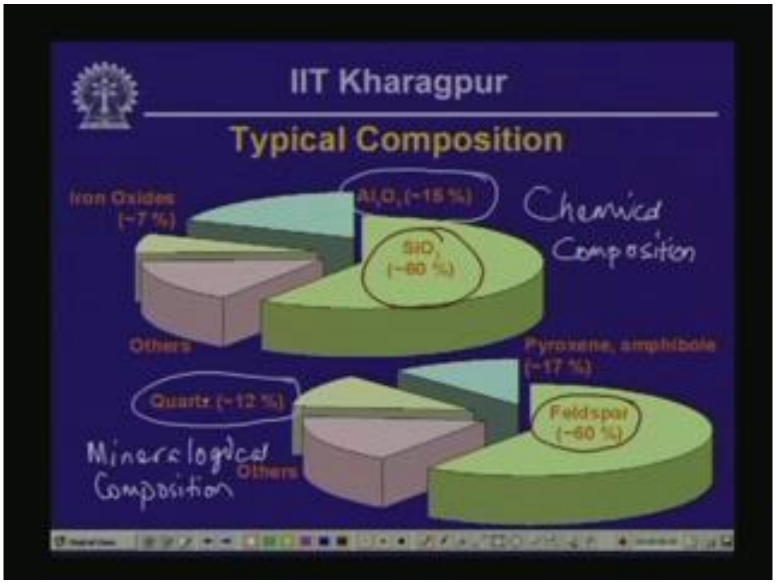

These are the chemical and mineralogical compositions of a typical magma and actually you should also try to understand this is a typical compositions of magma and there is a large range over which this typical compositions can vary and that actually gives rise to many different types of magma and solidification of those types of magmas as a result leads to a very very wide variety of igneous rocks. So, the typical ranges are shown here and you should not conclude that these are the only compositions that may be possible for a partially molten rock forming material.

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So, as I indicated that there is a large, very large variety of igneous rocks and large variety is mainly coming from the range of composition of magma or the parent material and based on this, we have to classify the different types of rocks, different type of igneous rocks and what we are going to base our classification on is the way the igneous rocks formed or the genesis of these rocks, then we are going to look at the texture of individual igneous rocks or the percentage of crystalline material within the matrix or the orientation of the grains and so on and so forth that is what is known by the word texture, then thirdly, we are going to look at the mineralogical composition in order to classify igneous rocks.

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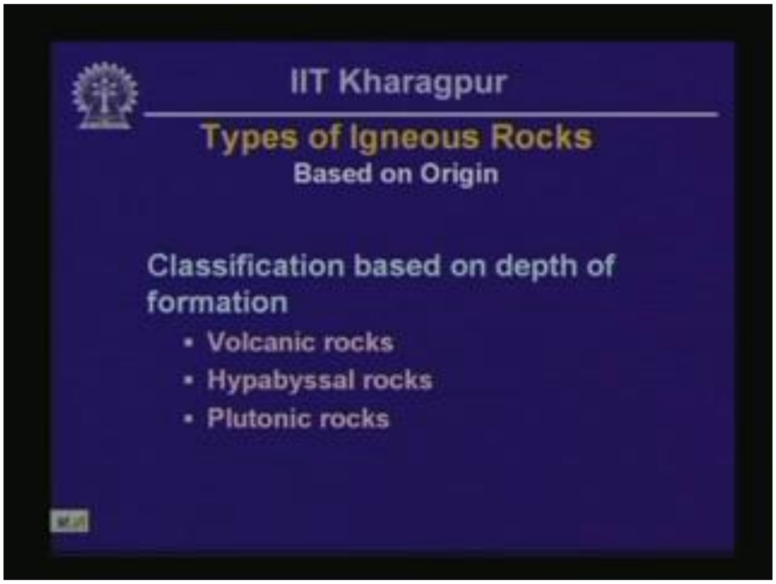

So, as we will see that really there is a large variety, large combination of those characteristics. Now primarily, igneous rocks based on the genesis, igneous rocks can be classified as volcanic rocks or plutonic rocks or hypabyssal rocks. This is basically really classification based on the depth at which the parent partially molten material exists at the time of the formation of rock.

So, if the parent magma occurs at great depth, then what we get is volcanic rock. If lava comes at the surface, then sorry if lava comes at the surface, then we get volcanic rock; so, this is when ejection of lava takes place, ejection of lava takes place. Then plutonic rock is when magma exists at great depths and this one is really an intermediate state in which magma occurs at a shallow depth but nevertheless the rock formation takes place underground.

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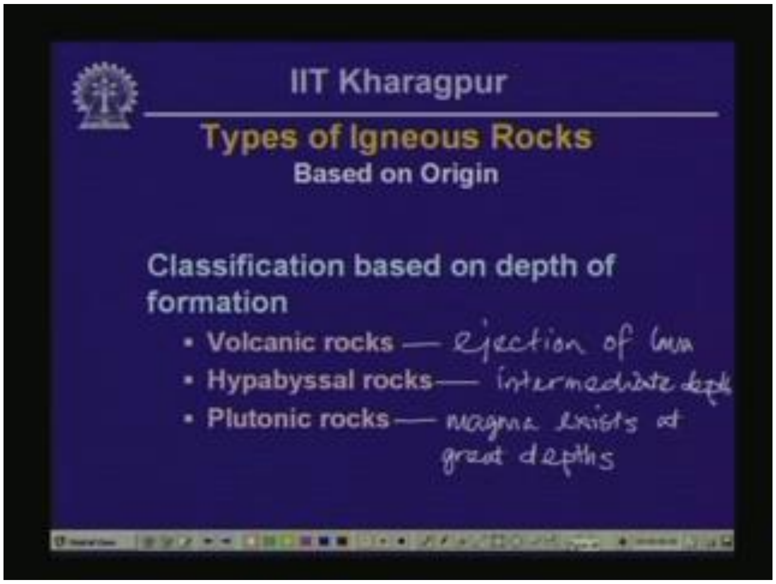

So, volcanic rock is when lava comes to the surface and plutonic and hypabyssal rocks forms directly from the cooling of magma.

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Now, what is volcanic rock? As I indicated, volcanic rock develops because of cooling and crystallization of lava when lava comes to the surface and comes in contact with cooler atmosphere. The ejector can also include fragments are preexisting rock or volcanic ash and these materials can also get welded together because of the heat of the process and lithify or rock mass forms out of the process. So, what we get here; very main characteristic of this process is a fast cooling of the rock forming material.

The lava in fact, cools within a few days or few months in this case which is relatively quick in geologic terms and as a result, the grains that these rocks are comprised of are microscopic or very small in size, sometimes there is no visible crystals within the rock mass and the common types of this rock, common types of volcanic rocks includes rhyolite, dacite and basalt. Basalt in fact is a very large proportion; it forms a very large proportion of all igneous rocks as will be available on the surface of the earth or near surface.

Now, what we look at, we try to look at the texture and chemical, texture and chemical composition and formation temperature of different types of volcanic rocks.

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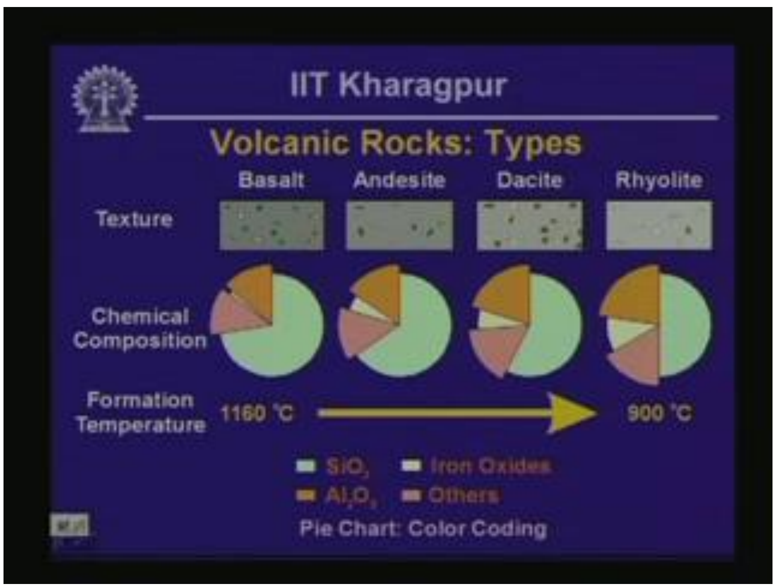

We look at the major categories of volcanic rocks - basalt andesite, dacite and rhyolite. The textures, typical textures are indicated on the top of this particular cartoon and you can see that the abundance of crystalline material, the crystalline material on these textures are indicated by polygons and the background gray material is essentially non crystalline matter.

You can see in this case, the crystalline material actually forms a very wide percentage of the total rock mass but they are seldom, they form, they seldom form interlocked texture unlike plutonic rock; we will see that later.

Then, we look at the chemical compositions shown at the pie charts at the center of this particular cartoon and you can see that silica is by far the largest percentage as you would expect.

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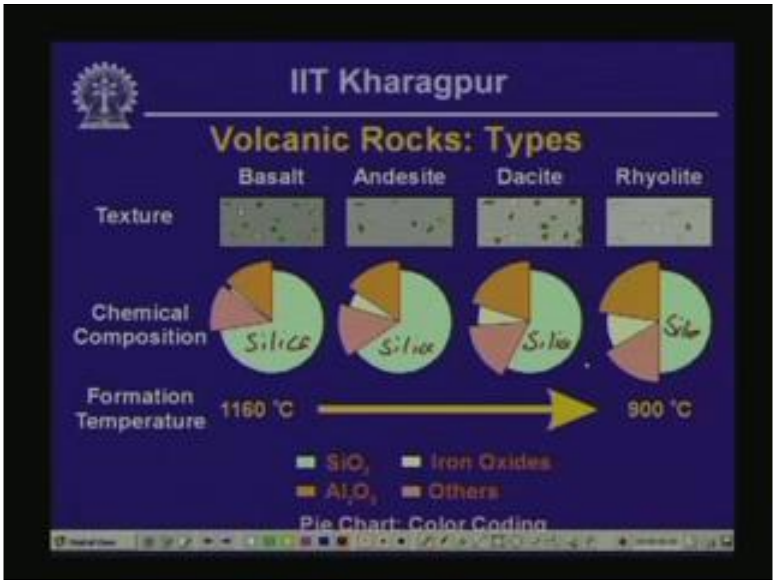

So, this color represents the silica percentage and that also actually varies over a very wide margin. You can see that the silica percentage in basalt is much smaller compared to silica percentage in rhyolite and that is also a reason why the appearance, the color of basalt is likely to be much darker, much darker in comparison with rhyolite and the chemical composition really is a reflection of the chemical composition of the parent magma and if the parent magma had smaller percentage of silica, then what you get is basalt rock and if the magma has got a much larger proportion of silica, then you end up with a rhyolite material and the formation temperature of these particular rocks also vary over, also vary over a very wide range and the basalt rocks form at a much higher temperature in comparison with rhyolites.

In fact, basalts originate from solidification of magma at say 1200 degree Celsius; whereas, rhyolites form only at about 900 degree Celsius. You should also realize that silica percentage actually affects the flow characteristics of the magma also quite a bit and if you increase the silica percentage, then magma tends to be less mobile.

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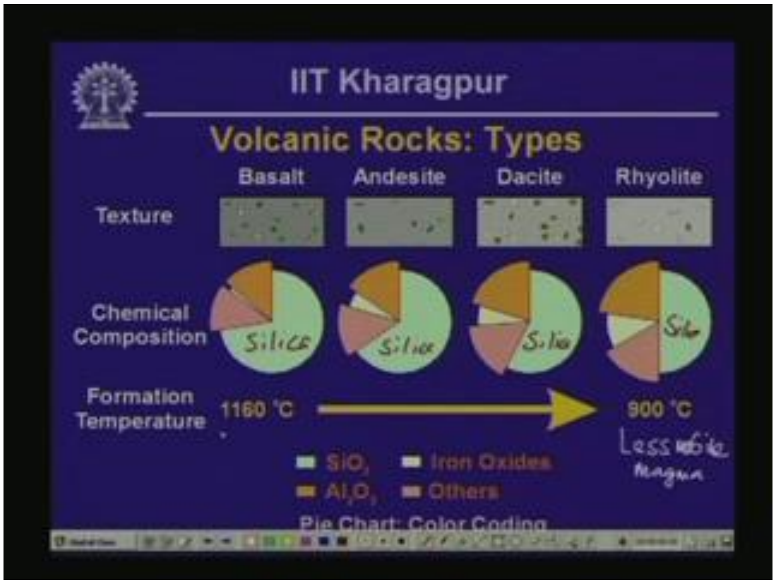

So, what we get here actually is as you go towards the right, you have got less mobile magma and whereas in case of in case of smaller silica percentage, you are going to get, you are going to get a magma that is susceptible to flow type features. The viscosity actually is much smaller in case of magma which has got smaller proportion of silica. And, the other chemical constituent of these magmas are also indicated, also color coded. So, you should notice the color code at the bottom of this particular, this particular slide here. The orange shade indicates alumina whereas the light yellow or half white, color indicates oxides of iron - ferric iron or ferrous iron.

So, that kind will tell you that volcanic rocks can also vary over a very wide margin in terms of their texture, chemical composition and formation temperature and now we would like to look at the other types of igneous rocks, similar characteristics of other types of igneous rocks.

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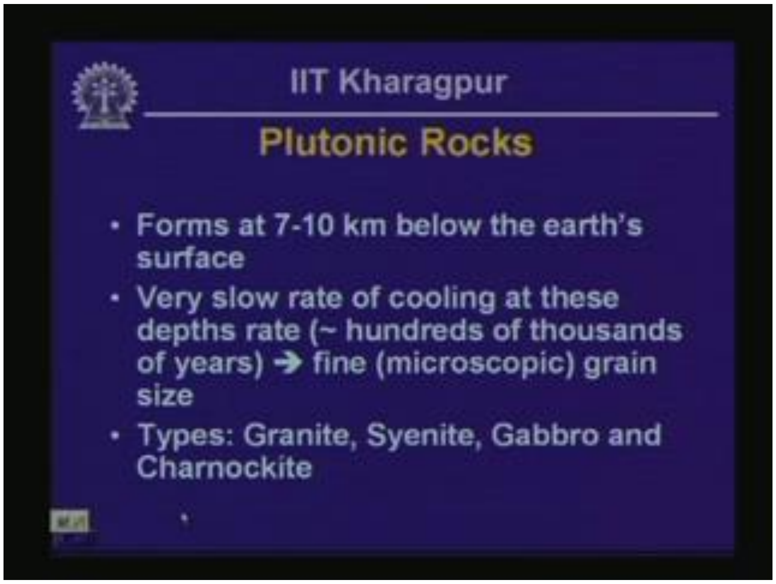

We first consider plutonic rock, these are two extremes really; one was volcanic rock, volcanic rock is when magma gets ejected to the surface and plutonic rock that forms out of solidification of magma at great depth. Here, the depth involved, the depth at which the magma occurs is 7 to 10 kilometers below the surface and because of the fact that it is underneath such a high over burden pressure, the cooling rate the cooling rate the rate at which the magma can loose heat is also very small and the cooling of magma takes place over several million years and as a result what happens, the crystal growth in this case is much more remarkable in comparison with volcanic rocks. The slower the cooling rate, much larger crystals can grow and in fact you will see that interlocked crystal structures are typical of many different types of plutonic rocks.

Now, the examples of plutonic rocks include, a very major proportion of plutonic rock actually is granite and then the other types including Syenite, Gabbro and Charnockite. Charnockite is another type of rock which is available over a large portion of the Deccan peninsula.

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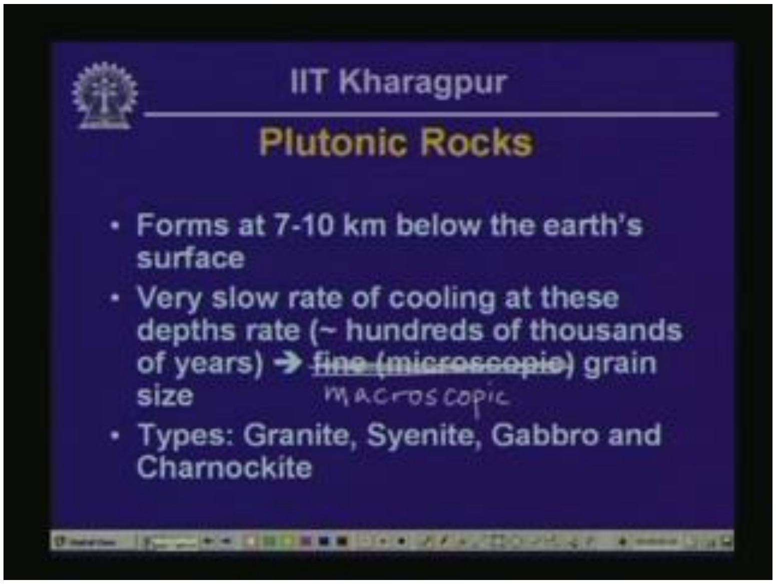

So, what we are going to get in this case; actually there is a mistake on this particular slide I noticed, it is not really, plutonic rocks are not composed of fine or microscopic grains, fine or microscopic grains but it is composed of macroscopic, macroscopic crystals, actually macroscopic crystals. We will see that when we proceed further along; so, you should notice the change here.

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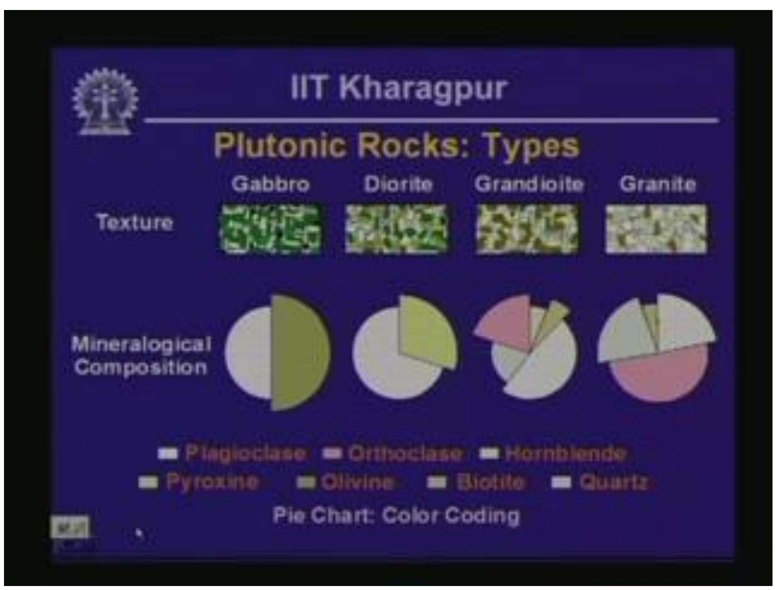

Now this one here, this particular slide is a counterpart of a similar slide that I showed earlier for volcanic rocks. Now, this one shows the texture as earlier of different types of major plutonic rocks - Gabbro, Diorite, Grandiolite and granite and the mineralogical composition, mineralogical composition of these rocks are indicated with pie charts at the bottom. You try to notice the difference between the previous slides for the volcanic rock; here we are looking instead of the chemical composition, the mineralogical composition of the rock mass.

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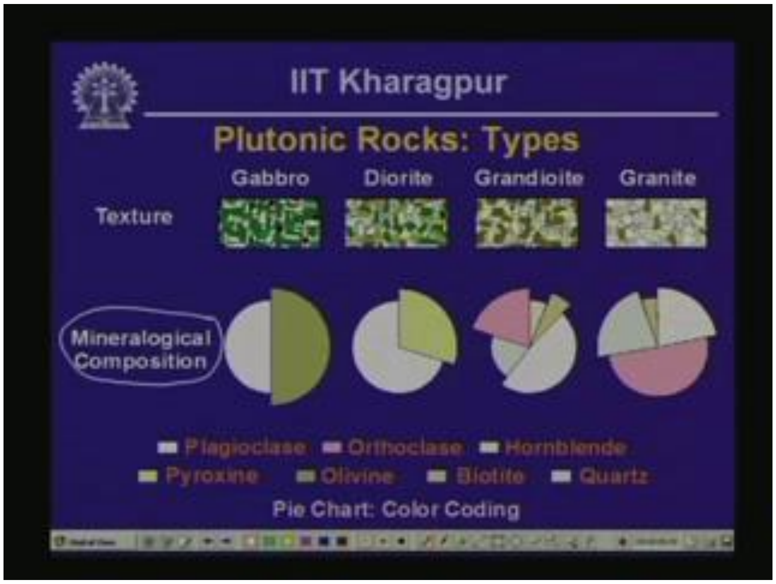

Now, here also you can see that what we are getting is we have got a wide range of mineralogical composition while the rocks towards the left of this particular slide, Gabbro for instance; is composed of primarily dark colored minerals, one of the chief components is olivine and you also have got plagioclase in this case and as we proceed to the right, what we find is that light colored minerals become more and more abundant.

In granite for instance, we are going to be having orthoclase, orthoclase and plagioclase feldspar as well as we have got a very large proportion of quartz and some smaller component is composed of biotite. So these grains here, the grains, brown colored grains, they are essentially biotite grains within the mass of granite and then you have got quartz, actually let me use two colors; so have got quartz and in addition to it, you have got feldspar. So, these are in this case, feldspar grains.

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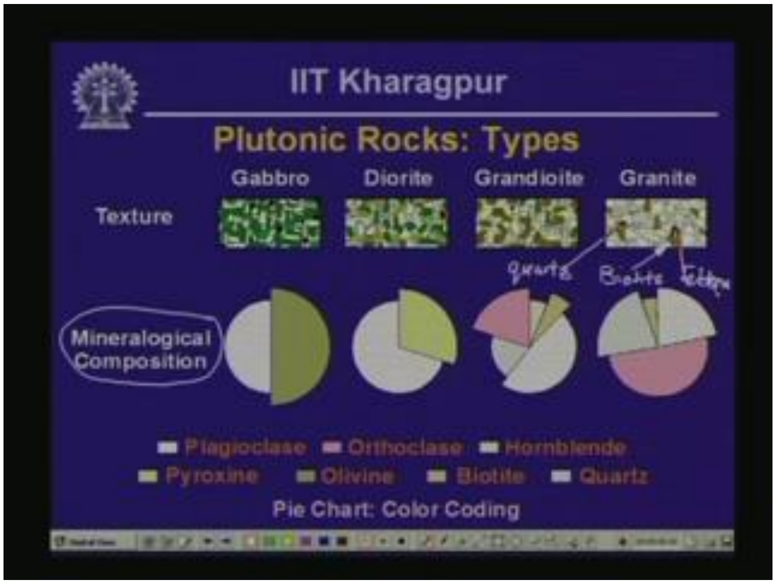

So, you should notice here and again, actually you should notice that the pie charts are color coded and the color code is given at the bottom of this particular slide. You should notice one trend here is that as we proceed from the left to the right of this particular slide showing different textures of different major classes, major types of plutonic rocks; as we proceed from left to the right, the composition becomes more of felsic type and the rocks on the left are composed of mafic minerals.

So, these types of different rocks also would be expected to vary over a very wide range as far as their weathering susceptibility is concerned.

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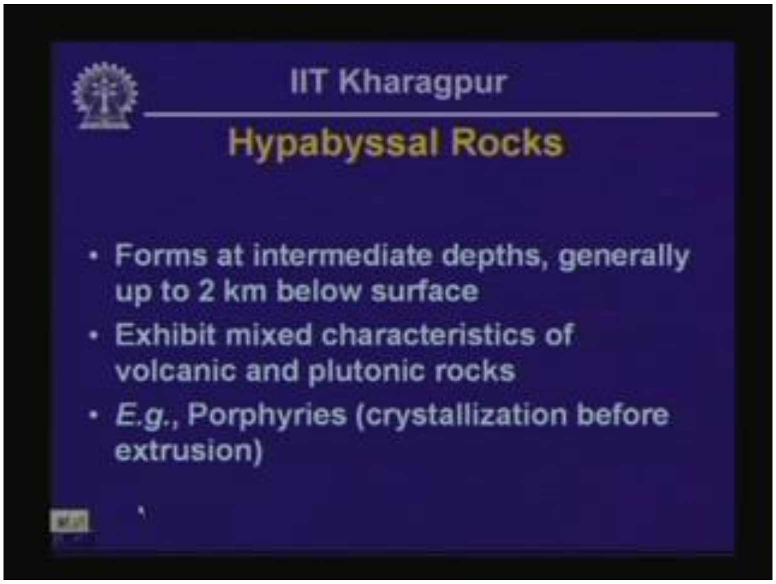

Now, the third class of the igneous rock is hypabyssal rock and as I indicated earlier that these rocks are really intermediates between plutonic rock and volcanic rock and these rocks develop from solidification of magma at intermediate depth, typically 2 to 3 kilometers below the surface; you compare that number with that of the plutonic rock where magma cools at depths of 7 to 10 kilometers.

So, these rocks actually have got intermediate cooling rate. So, they do not cool as fast as the cooling of volcanic rock or as well as they do not cool as slowly as a plutonic rock. So, they exhibit intermediate crystal formation, intermediate proportion of crystalline material within the mass. An example of this type of rock includes porphyries. We will see what are the different textures involved with these types of rocks as we proceed through this lesson in one of the later slides. But before that we consider the types of igneous rocks based on their mineralogical composition.

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Now, I indicated this one earlier when I was presenting the different types of rocks, different types of plutonic, different types of plutonic rocks and there I indicated that the characteristics of rock will vary over a very wide range depending on what proportion of it is composed of dark colored minerals, the minerals composed of iron and magnesium as opposed to light colored mineral are felsic minerals composed mainly of silica and alumina.

I also indicated that this proportion, the proportion of felsic and mafic mineral within a rock that strongly affects the susceptibility of a rock to weathering because the constituent mineral will have different susceptibility weathering, chemical weathering.

The categories as far as the proportion of dark colored mineral and light colored mineral is concerned; one could actually, one could actually get ultra-mafic rocks which are composed mainly of very very dark colored mineral and then if it is composed mainly of very light colored mineral, then you are going to get a rock that is called a felsic rock. Felsic rocks are basically of basic chemical composition; whereas ultra-mafic and mafic rocks are of acidic composition, they are also called acidic rocks.

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Now, we will look at the texture of igneous rocks because igneous rocks can also be classified based on their textural characteristics. Now, first question that comes to mind is what is meant by texture and texture really is mutual relationship of different types of mineral constituents. What I mean by that is what proportion of the rock mass is composed of crystalline material, what is the granularity of the rock and what is the distribution of these crystals within the rock mass which is called the, which is given the name fabric.

Now, there are several different types of igneous rocks; as far as their textures is concerned, texture is concerned. If they are going to be mainly composed of crystalline material, interlocked crystals, then it is going to be known phaneritic igneous rock and if it is going to be composed very little of crystalline material, then it is going to be called aphanitic or it is going to be called a glassy crystalline, an igneous rock of glassy texture.

Then there could be other types of texture also called vesicular texture or fragmental texture. By vesicular texture what is meant is that magma is going to be composed of gases, dissolved gases and these gases may come out of solution and that actually forms, that forms gas bubbles and they end up with development of vesicular structure as we will see in one of the pictures later on.

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This one actually is an illustration showing different types of textures of igneous rocks; one on the left is glassy texture where there is the crystalline form is eventually non-existent. Then the next one at the middle is a picture of basalt block, a dark colored basalt block. In this case, crystal size is typically less than one millimeter and on the right is a phaneritic texture. What we see here is a picture of granite and here crystal size can reach 10 millimeter.

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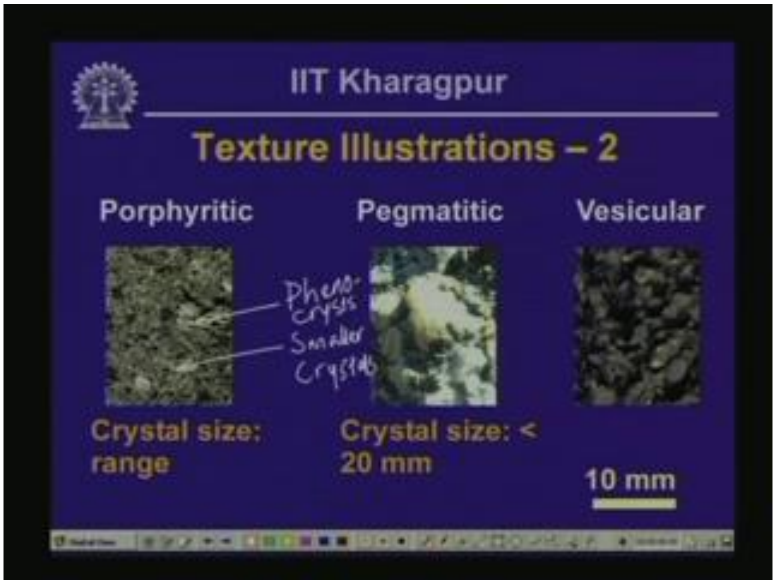

A porphyritic texture can vary a very large range of crystal sizes and here you can see that a large proportion is composed, actually a large proportion is composed of smaller crystals and there are a few large crystals in the mass and these things are called phenocrysts; so, these things are called phenocrysts.

Then you could have pegmatitic structure. In this case, the crystal size could be very very large indeed and you could get crystals as large as 20 millimeter and vesicular structure is shown on the right and here you could see very clearly the bubbly nature of this particular texture. The scale in this case is noted on the right bottom for comparison of these different types of pictures and scale by the way was indicated on the previous slide as well.

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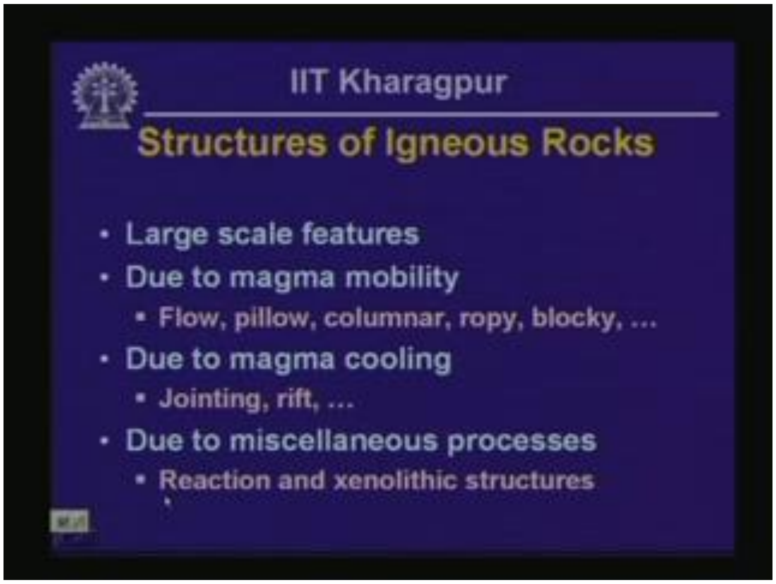

Then, igneous rocks can also be classified based on their structures. Structures are really large scale features; they may develop because of different types of mobility of magma. We looked at the mobility of magma or viscosity of magma when we were considering the classification of different types of plutonic rocks in one of the earlier slides of this particular lesson and it could also be because of cooling, differential cooling of magma as a result of which development of joints and rift structure could develop within the rock mass.

Then there could be miscellaneous chemical processes. For instance, there could be reaction or xenolithic structure in which a rock mass, a magma could include preexisting rock fragment and that rock fragment can also partially react with the surrounding magma as the rock forming process continues.

So here, what we are looking at large scale features really of the rock mass unlike texture where we were concerned with microscopic features.

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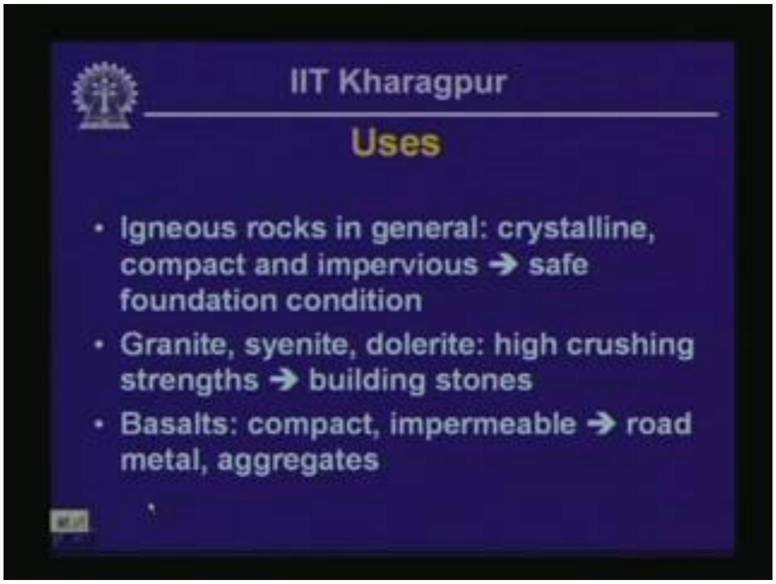

Now, we look at the uses of igneous rock. Igneous rocks, igneous rocks as was apparent from this presentation; igneous rock is mainly crystalline, compact and impervious. As a result, it gives a safe foundation condition for heavy civil engineering projects like tunneling project or dam project.

Now, many of these rocks have got very high crushing strength or shear strength, these rocks are very good building materials; examples are granite, syenite and dolerite. Then basalts, many type basalts and other types of igneous rocks; there are compact and impermeable. So, they are used as road bed metal and other aggregate resources.

So, these are some chief uses of igneous rocks and igneous rocks also contain veins of precious and semi precious metals. So, they are the primary, they are the primarily engineering uses of igneous rocks.

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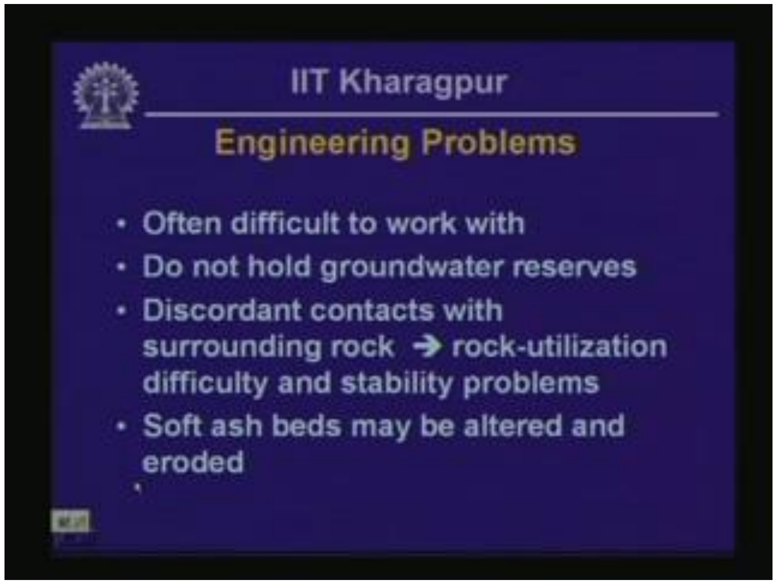

Now, igneous rocks generally pores, I mean the problems, the typical, the construction problems are infrequent, quite infrequent in case of large civil engineering project, in an igneous rock terrain. However, there are some problems which are indicated on this particular slide; igneous rocks are often difficult to excavate a blast, so they are difficult to work with; then igneous rocks do not hold groundwater reserves because of the impervious nature; then igneous rocks could have discordant contact with the surrounding rock, this could lead to rock utilization difficulty. So, those are the problems, typical problems.

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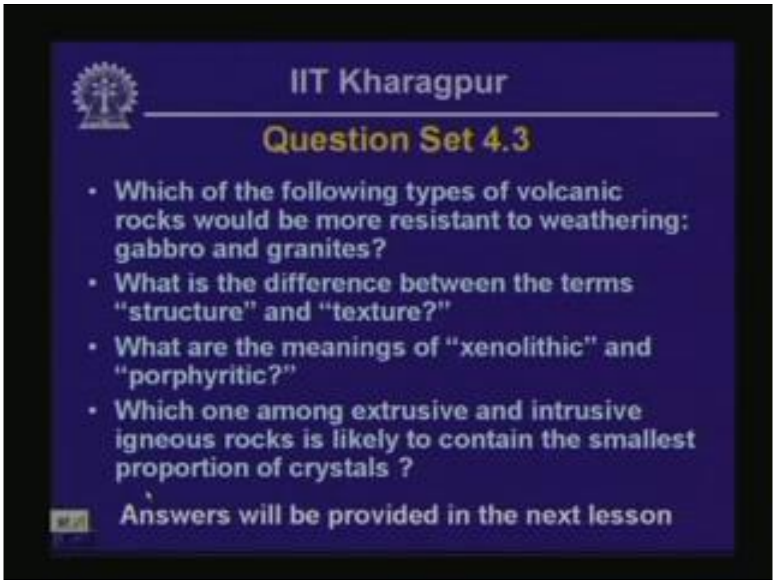

Finally, we end this particular presentation with a question set. First question is that which of the following types of volcanic rocks would be more resistant to weathering: Gabbro or Granite? Then the second question that I give you is what is the difference between the terms - structure and texture? Third question that I ask is what are the meanings of xenolithic and porphyritic structure or texture? And, the forth one is which one among extrusive and intrusive igneous rocks is likely to contain smallest proportion of crystals?

Try to answer these questions on your leisure and we will look at the answers when we meet again for the next lesson with that I wrap up this lesson. And, thank you very much for your attention.

Bye now.

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Hello everyone and welcome back. Today we are going to study about sedimentary rocks in lesson 4.4. Like we did in the previous lesson for igneous rocks; we are going to look at different processes in which sedimentary rocks form and what all they are major users and engineering issues involved with the sedimentary terrains.