Hello everyone
Welcome to this module on classification
of igneous rocks i am Dr Manoj Ibrampurkar
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In this module we will learn about
IUGS classification
using QAPF double triangle.
At the end of this module you will be
able to classify
felsic and intermediate igneous rocks
using QAPF
double triangle recommended by IUGS.
A QAPF double triangle looks like this.
Quartz is plotted here at this apex
this is alkali feldspar and this is
plagioclase
and this is feldspathoid
when felspathoid is present quartz will
be absent
and when quartz is present feldspathoid
will be absent because felspathoid
is an undersaturated mineral in silica.
This is the first triangle that is the top
triangle QAP
Quartz is 100 here zero percent along
this base of the triangle.
it is five percent here twenty percent
along this horizontal line
sixty percent along this horizontal line
and ninety percent here.
these lines indicate the ratio between
alkali feldspars and plagioclase
for example along this line
alkali feldspar is 10 percent and
plagioclase
is 90 percent along this line
alkali feldspar is 35 and plagioclase
is
65 percent along this line alkali
feldspar
is 65 percent and plagioclase is
35 percent whereas along this line
alkali feldspar is
90 percent and plagioclase is 10
so they represent constant

ratio
between alkali feldspar and
plagioclase
A rock that contains more than 90
percent of quartz
that is this small triangle will be
called as quartzolite
whereas a rock that contains
quartz between ninety percent and sixty
percent
and remaining is alkali feldspar and
plagioclase
should be called as quartz rich
granitoid
now these rocks are relatively rare a
quartz vein may be
called as quadrolite
the more common felsic igneous rocks
fall in
this field where
the largest field represents the granite
now according to this classification a
granite
should have quartz between 20 to 60
percent
similarly alkali feldspar should vary
between
35 percent to 90
percent whereas plagiocase should be
between 10 percent to 65 percent
a special category of granite
is recognized where alkali feldspar is
more than 90 percent and this category
is called as
alkali feldspar granite whereas
if the rock contains more than 65
percent
of plagioclase it will be called as
granodiorite
a special category of granodiorite where
plagioclase is more than
ninety percent is called as tonolite
or trondhjemite a tonalite when
mafic minerals are
more than 10 percent while trondhjemite when
mafic minerals are
less than 10 percent. of course

the quartz should be between 20 and 60
both for granodiorite as well as tonalitet or
trondhjemite. Below this
is the field for intermediate igneous
rocks
where quartz will be less than
20.
now if you recollect hatch and wells
classification
this entire field where alkali feldspar is
more than 65 percent
should be called as Syenite. this field
where plagioclase is more than 65
percent should be called as
diorite whereas this field where both
alkali phase parent plagioclase
is almost in equal amount should be
called as monzonite.
However
IUGS recommends that
rocks with more than 65 alkali feldspar
and quartz less than five percent should
be called as Syenites
if quartz is more than five percent and
less than
20 percent the rock should be called as
quartz
Syenite. similarly
special categories of Syenites and
quartz Syenite are recognized
where the alkali feldspar is more than 90
percent
and in this field where alkali feldspar is
more than ninety percent
the rock is called as alkali feldspar syenite
whereas here it will be called as quartz
Alkali feldspar syenite. For
diorite, the definition has been made
more strict and it says that
only that rock which contains more than
90 percent of sodic plagioclase
should be called as a diorite. So
diorite will fall in
this small field. Of course, the rock
should have sodic plagioclase.
If the plagioclase is calcic plagioclase
the rock will be called as

anorthosite. so the rocks
where sodic plagioclase is more than 65
percent
but less than 90 percent are here
called as monzodiorites
and if the quartz content is more than
five percent
and less than twenty percent the rock
will be called as
quartz monzodiorite. Similarly diorite
and anorthorsite will have their
quartz rich varieties which will be
called as quartz diorite
and quartz anorthosite.
Now all these are saturated intermediate
igneous rocks
if we go below this base
that means silica is absent. Quartz is
actually the free quartz if absent
automatically feldspathoid will start
crystallizing
so Syenite will go down here. monzonite
will go down here
and monzodiorite and diorite will go down
here
so the lower triangle shows these rocks
so this is a field where Syenite will
have
a feldspathoid. now
10 percent of feldspathoid
is allowed in the Syenite until then
the Syenite will be called as foid
bearing Syenite
or monzonite will be called as foid
bearing monzonite
or monzodiorite will be called as foid
bearing
monzodiorite or diorite will be called as
foid bearing diorite. Only when
feldspathoids are more than 10 and
less than 60 percent so this field
is where the rock will be directly
called as a foid syenite
for example this is nepheline Syenite
where alkali feldspar will be more than
90 percent
and the foid that is nepheline will be

between 10
to 60 percent. Similarly
you will have foid monzosyenite, foid
monzodiorite and foid diorite.
those rocks which contain more than
sixty percent of
feldspathoids are categorized into a
special category
called as foidolites examples of these
rocks are ijiolites
or nephelinite
so both these triangles put together
the QAPF double triangle looks like this.
we have to calculate the felsic minerals
on a 100% basis and plot
on these triangles so wherever it plots
the rock is given the name of the rock
Also, as i said earlier
QAPF double triangle classification
should be used
essentially for phaneric rocks. However
if we replace
the plutonic terms with volcanic terms
that is granite with rhyolite
granodiorite with dacite
Syenite with trachyte monzonite with
latite
and diorite with andesite
we can use the classification for
volcanic rocks.
also however the essential criteria is
that the rock should be phaneric that is the
minerals
should be identifiable. If the rock is
glassy
this classification is not recommended.
So to summarize IUGS classification
is modal or mineralogical classification.
it uses minerals as end members on
ternary diagrams and
it is primarily used for plutonic
igneous rocks that is phaneric rocks
these are the references for this topic
thank you very much