Effect of different physical parameters on roundness of clastics

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Abstract

Roundness of clastics is often correlated with other physical parameters. In such correlation the effects of various other factors are to be taken into account. Point bar samples from River Tista were studied to show such effects in roundness-size, roundness-distance and roundness-sphericity correlation. It is found that roundness (i) decreases with decrease of size, (ii) increases with more transportation, (iii) increases with increase of sphericity for granitic clasts and (iv) decreases with increase of sphericity for schists.

Roundness is a readily observable physical property of clastics and it describes the grain surface curvature. The importance of this property of clastics need not be elaborated much except mentioning its usefulness in evaluating porosity-permeability, and its significance in environmental studies. Various authors appeared with various methods of calculating roundness but verbal classification accompanied with visual comparator is most handy. In this study, Powers' (1953) chart has been used. The degree of dependence of roundness on other physical parameters like size, shape, distance travelled and lastly the nature of the clastics i.e. lithology, has been discussed.

Point bar samples were collected from four sites within a 40 km. mountainous reach of River Tista of north Bengal, India. Roundness index values were recorded both in the field and under the binocular microscope, for different size grades, from 256 mm to .062 mm and for two different lithotypes namely granites and schists. For grains less than 1 mm this separation was not attempted. Krumbein's (1941) intercept sphericity was calculated for clastics within the size range of 256 mm - 2mm. Thus the sampling picture is like this : from a single point bar deposit the entire size range spectrum (256 – .062 mm) was collected, divided into two types granites and schists (except 1 – .062 mm), sphericity has been calculated for size range 256 mm – 2 mm and ultimately the roundness values were recorded for all the clastics. This operation was made from four different point bars. Data has been plotted taking two variables at a time, one of which is always roundness.

Roundness values are plotted (Fig. 1a) against different size grades. Samples are from all the four sites. Separate plots have been made for granites and schists. The scatter forms an exponential band. The relation between the two parameters, is that roundness decreases exponentially with the decrease in size. It is apparent from the plot that lithotype has no control in roundness-size correlation. Some other factor is responsible for the band and it is presumed to be the transportation or the distance travelled by the particle. The plots are from four sites and as roundness may increase or decrease with more transportation, there is a scatter in the direction of roundness value and hence the exponential band. The width of the scatter being proportional to the function related to transportation. The physical significance of the exponential trend is discussed in the light of field observation. It has been seen while recording the roundness values that within the range 256 – 1 mm, clastics of 8 mm – 4 mm size are very poorly rounded as most of the grains are broken

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in this size range and this is considered to be the lower limit of roundness developed in a rock fragment after which it breaks down and initiates a new cycle of roundness.

Roundness values from each site for all size grades and for the two rock types, are plotted and from figure 1b it is obvious that there is an increase of roundness value in down-stream direction and this supports the presumtion for the exponential functional relation between Roundness and size in the form of band. Here the scatter is much more indicating a greater effect of size on roundness-transportation correlation.

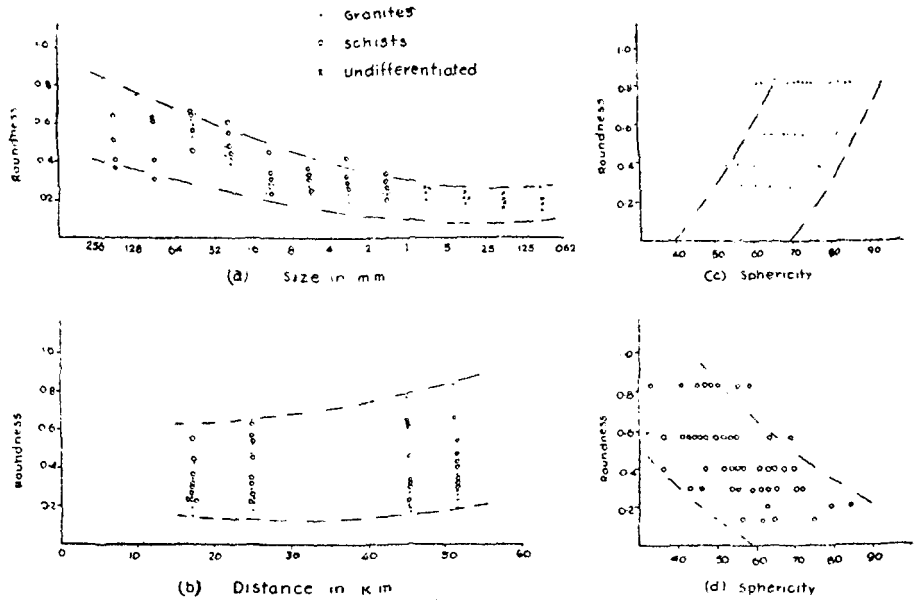

Figure 1. Scatter diagram showing relation between roundness and other parameters.

The concept of sphericity and roundness are distinct and are theoretically independent. However in natural situations they are often found to be closely related (Pettijohn, 1956). Intercept sphericity and roundness values are plotted separately for granites and schists (Fig. 1c, d). Different trend of plots indicate different relation between roundness and sphericity for granites and schists. Whereas roundness increases with the increase of sphericity (Fig. 1c) for granite cobbles and pebbles, roundness decreases with the increase of sphericity (Fig. 1d) for schistose rocks. Here also scatter forms a band which is due to the effect of size.

Thus for any correlation between roundness and other physical parameters of clastic particles it should be kept in mind the effect of others that may have a direct or indirect influence on the concerned correlation. For an approximately univariant relation other possible variables are to be minimized and kept constant without which there is every possibility of obtaining relation that are non-existing and true relations may turn to be a confusing one.

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Sodalite-cancrinite-fluorite syenite from the granitic terrain of Podili, Prakasam District, Andhra Pradesh

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Abstract

The present paper reports the occurrence of sodalite-cancrinite-fluorite syenite from Podili. This felspathoidal syenite is inferred to be formed by the crystallisation of alkaline felsic magma, derived by the partial melting of deep-crustal rocks, enriched in volatiles.

Introduction

The occurrence of syenites and especially felspathoidal syenites is extremely rare in granitic terrains. The present paper reports the occurrence of sodalite-cancrinite-fluorite syenite from the grey granites of Podili (15°38′ 15″N-79°36′45″E), Prakasam District, Andhra Pradesh.

The three Taluks – Kanigiri, Podili and Darsi in Prakasam District have attained some notoriety on account of the prevalence of an endemic disease called fluorosis caused by excess of fluorine in waters of the area. The ultimate source of fluorine is the fluorite found in the grey granites. Although several schistose rocks, grey granites, gabbros, pink granites and dolerites are present, none except the grey granite contains fluorite. The grey granite hosts the sodalite-cancrinite-fluorite syenite reported here.

Petrography

The syenite within the grey granite of the low-lying lands near Podili occurs in two patches, 100 metres apart, each measuring two metres by one metre. It is grey-coloured and is conspicuous on account of the presence of blue-coloured sodalite in the form of veins.

The rock exhibits hypidiomorphic-granular texture and has perthite and sodalite as major and plagioclase, nepheline, cancrinite, fluorite, biotite, muscovite and iron ore as minor constituents. Potash felspar is a perthite in the form of coarse grains. Plagioclase (An_{20}) is subordinate and is fine grained. Sodalite occurs as veins cutting across the felspars. Fluorite occurs as small veins and discrete grains. At times sodalite veins narrow down and merge with the fluorite veins forming a continuous vein. Both sodalite and fluorite are isotropic, the former has higher refractive index