THE COMPARATIVE ALBEDO ANALYSIS OF POWDERED SUBSTANCES AND THEIR MIXTURE.

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It is known, that albedo of mixtures of powdered substances is usually less than average albedo of the mixture components from this mixtures. This fact, nevertheless, is not enough supported neither by experimental nor by theoretical quantitative data.

We have carried out laboratory photometric measurements of colored finely powdered substances with the use of filters (λ_{eff}=0.43, 0.55, 0.63μm) at the phase angle of 5° [1,2]. Albedo of the samples varied at a wide extent approximately from 3 to 97%. Binary mixtures with approximately equal quantitative sample ratious of both components had been used, too. The following results had been obtained (Fig.1).

The greatest differences of albedo of the mixtures (A_{mix}) from the average albedo, determined according to the separate components (A_{aver}), occurs in the case, when the reflectivity of mixture components differs to a greate extent.It is natural that this situation is realised,approximately in the middle of the albedo scale. The following pair of components illustrates this: MgO ($A = 96\%$) and carbon black ($A = 2.5\%$). In this case A_{aver}= 50%, but A_{mix}= 20%. Generally, mixtures of different coloured substances with the white powder of MgO are giving the separate trend on the A_{aver} - A_{mix} diagram (data are defined by crosses).

The observed pecularity of A_{aver} - A_{mix} diagram can be theoretically described in the frames of model of spectral dependence of albedo from powdered surfaces which is presented in [3]. denoting the probability of photon survival in the particle of one and another sort through X and Y, according to [3] we have:

$$A_{aver} = 1/2 \{1/X + 1/Y - (\overline{\sqrt{1/X^2-1}} + \sqrt{1/Y^2-1}) \} ;$$

$$A_{mix} = 2/(X+Y) + \overline{\sqrt{4/(X+Y)^2-1}} .$$

The results of calculation according to these formulae are shown in Fig.1 by the solid lines; the numbers are corresponding to the following values Y: *1 - Y=1, 2 - Y=0.8, 3 - Y=0.5, 4 - Y=0.1*, in all cases X varies from 0 to 1. As it is seen from Fig.1, the curve 1 is well modellung the mixture trend of diffirent substances with MgO. The point corresponding to the maximum contrast of albedo components ($Y=1$, $X=0$) has the values of A_{aver}=50%, A_{mix}=27%, which approximately corresponds to the experimental data. Both the theoreticat and experimrntal data give $A_{aver}=A_{mix}$ on the bounds of albedo range.

The obtained results might have the following consequences in the tasks of the distance spectrophotometric remote sensing of solid planetary surfaces. Let the spectrum of albedo of solid planetary surface has, for example, pyroxene absorption bands (1 and 2μm). In accordance with the represented results the estimation task of the absorver concentration using the depth of the bands seems to be hopeless without information concerning the character of opticai heterogenity of the surface.

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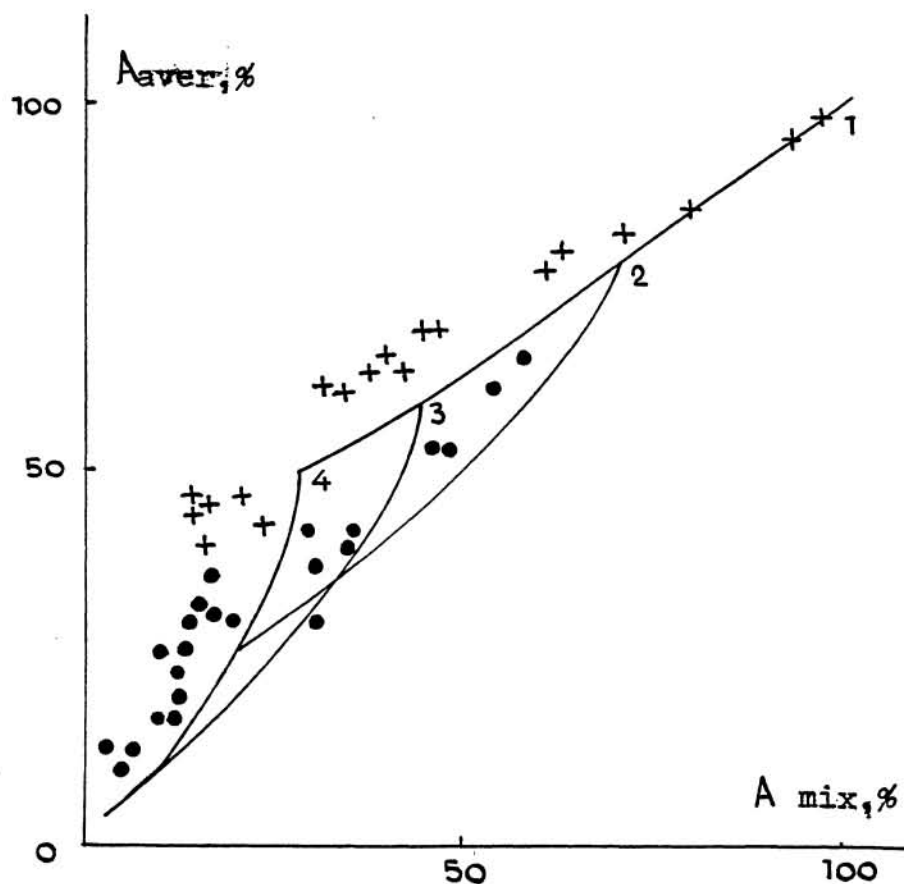
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