

er white pigments and what properties do they possess which warrant their use? Great hiding power has already been mentioned as an outstanding distinguishing characteristic. Chemical stability and inertness is another. Titanium oxide will not react with strong hydrochloric and nitric acids. Hydrochloric acid or hot concentrated sulphuric acid is required for its solution and a fusion is necessary in order to obtain a reaction with alkalis.

Partly depending upon the above two properties in which these pigments differ from other white pigments and partly depending upon properties which they possess in common with others, eight distinct qualities of titanium pigments should be mentioned.

Distinctive Qualities

First: Titanium pigments are very high in opacity. The barium base pigment will hide from 40 to 120 per cent. more surface than the other white pigments; the calcium base pigment will hide from 50 to 150 per cent. more; the pure oxide from 350 to 600 per cent. more. Titanium pigments possess concentrated hiding power to a far greater extent than was dreamed of a few years ago and this property alone has opened up many possibilities in emulation.

Second: There is no danger of bodying, ring or after yellowing on account of any chemical reaction into which titanium pigments may enter. On the contrary, so far as after yellowing is concerned, titanium pigments in some cases appear actually to retard after yellowing of oleo-resinous vehicles. This effect has not been definitely explained but it seems to be more than a simple masking of the yellow color due to the high opacity of pigments.

Third: Titanium pigments will withstand extreme conditions of exposure without alteration or discoloration. At high baking temperatures there is no discoloration, decomposition or reaction with vehicles. They are not affected by light.

Fourth: Titanium pigments may be the best means of preventing checking, cracking and scaling in outside paint films. They are used with entire satisfaction as the only pigment for making inside paints with varnish bases of vehicles, but for exterior paints made with common vehicles they are almost always used together with one or both of the older pigments, zinc oxide and white lead. It is well known that linseed oil paints in which titanium pigments are used alone chalk too rapidly on exposure to outside conditions. The very inert character of these pigments makes it advisable in order to obtain a sufficiently elastic film to incorporate in outside linseed oil paints a certain amount of pigment which is slightly reactive with the vehicle. In this respect this quality might be considered a disadvantage but as a matter of fact it is in reality a great advantage. The degree of chalking can be controlled by using titanium pigments in proportions to produce a film having a degree of hardness such that the chalking is only gradual and the painted surface even after a long period of years remains in excellent condition for repainting. There is no danger of ever having to apply a torch to an interior surface which has been protected by a titanium paint, provided, of course, that enough titanium was used in the paint.

Fifth: Titanium pigments have a high light reflective value. Magnesium carbonate and titanium oxide, universally accepted as the standard of highest brightness, have a light reflective value of 98 per cent. Titanium pigments have a light reflective value of about 90 per cent.

Sixth: Titanium pigments are practically a pure white.

Seventh: On account of their excellent color, total brightness and great opacity, titanium pigments produce clear color tones, free from muddiness, when used as a tinting medium.

Eighth: In particle size, titanium pigments are among the finest of the white pigments.

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adapted for certain purposes than any of the others. The calcium base composite, Titanox C, having the lowest specific gravity and consequently the highest bulking value, is especially well adapted for those goods in which a large volume of pigment per gallon of paint is desirable; the pure oxide, having extremely high opacity, is especially well adapted for those goods in which a small volume of pigment is desirable; the barium base composite, Titanox B, meets all ordinary requirements.

In the following tabulation specific gravities, bulking values, hiding power and oil absorption are shown. For the sake of comparison values for basic carbonate white lead, chosen as representative of the older white pigments, are included. The bulking values represent the pounds of pigment per solid gallon. The hiding power values represent the approximate number of square feet of black surface completely hidden by one pound of pigment.

	Bar- Cal-	White ium	cium	
	Lead	Base	Base	TiO ₂
Specific Gravity	6.7	4.3	3.1	3.9
Bulking Values	56	35.8	25.8	32.5

ments and the history of their development, but not a great deal is to be found in our general literature concerning titanium.

Titanium was discovered in 1791. William Gregor upon examination of a black sand found near his home in Cornwall, England, concluded that it was made up of the oxides of iron and of a new element. The black sand is now known as ilmenite and the new element as titanium. In 1795 M. H. Klaproth, in Austria, extracted a new element from a mineral now known as rutile and about two years later identified it with Gregor's new element. Klaproth gave it the name "titanic earth," from whence we now have the name titanium.

Some of the most noted inorganic chemists devoted time to research on titanium, and many of its compounds were prepared and their reactions learned during the last century, but no important commercial applications were made until about the beginning of the present century. This lack of commercial stimulus together with the fact that its concentrated ore deposits, existing as they do in rather remote corners of the earth, had not been found, no doubt largely accounts for its not having attracted more attention in the past.