# PRODUCTION OF WHITE TEXTURED PAINTS USING SILICATE WASTE

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## INTRODUCTION

The paint is widely used for coloring various objects or for pigmented coating of the surface for a decorative or protective effect. There are many types of paint, the use of which is decided according to the purpose and use of the object. Titanium oxide is used as a bleaching agent in the production of white silicate water-based paints, which has the highest value in the total cost of the paint. The aim is therefore to look for a way in which at least part of it can be replaced by cheaper components or even production waste.

One such waste could be the phosphogypsum formed by AB „Lifosa“, calcium sulphate, which is visually very white. The aim of this work is to produce white, textured, water-based paints using silicate waste - phosphogypsum, which would correspond in quality to industrial paints. Preliminary studies have shown that phosphogypsum is only suitable as a dye filler. The study produced high-quality paints that complied with paint regulations.

## MATERIALS AND METHODS

The main constituents of paints are pigments, fillers, films, solvents and other additives. In the work we used analogous raw materials used by one of the silicate paint manufacturers in Lithuania (see Table 1.)

**Table 1.** Chemical composition of paints produced Materials

| Materials | $H_2O$ | Bermocoll Prime 100 | 20 % KOH | Oratan 4045 | Faomaster 8034 | Phosphogypsum with 5 % CaO | $TiO_2$ | Ground marble | Dolomite | Acrylic resin dispersion | Crysol TT935 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Composition, %** | 24 | 0.4 | 0.2 | 0.2 | 0.1 | 0…50 | 3…5 | 1…5 | 1…25 | 20 | 0.1 |

The degree of whiteness of the paints, the gloss of the paints, its resistance to wet cleaning and the coverage were determined using various instrumental test methods adopted in the paint industry. These indicators determine the quality of white textured paints.

## RESULTS AND DISCUSSION

In order to evaluate the influence of one or another component on the properties of paints, we chose industrial paints as a reference example with known properties. Titanium oxide is used as a bleaching agent in the production of white silicate water-based paints, which has the highest value in the total cost of the paint. Initially, we tried to replace all $TiO_2$ with phosphogypsum performed. The results of the studies presented in Table 2 clearly show that such paints have significantly inferior properties and are not suitable for use. In addition, such paints have a pH > 9, so after prolonged storage, they deteriorate.

In order to at least reduce the amount of $TiO_2$ in the paint, we introduced phosphogypsum in a mixture with 5 % CaO instead of this component in the paint mixture as a bleaching additive. The addition of CaO neutralizes acidic impurities, resulting in a pH of the paint < 8, which ensured stable properties for a long time.

**Table 2.** Properties of paints

| Paints | Gloss, G* | Whiteness index, WE** | Coverage, kg/m² | Resistance to wet cleaning, μm after 200 cycles | Drying time, h | Viscosity, μPa·s |
|---|---|---|---|---|---|---|
| **Industrial** | 1.8 | 48 | 0.24 | 16 | 12 | 18.5 |
| **Without $TiO_2$ additive** | 1.9...2.5 | 32...40 | 0.55...0.62 | 23...32 | 12 | 20..20.5 |
| **With phosphogypsum additive** | 2.4...2.5 | 45...64 | 0.19...0.29 | 14...23 | 12 | 19...20 |

*- the gloss of the paints is examined with a spectrophotometer. Its scale is from 0 to 100, where 0 means a completely matte surface and 100 means a completely glossy surface; **- the indicator shows the purity of the white color.

Studies on the effect of phosphogypsum content on paint properties have shown that it can be added to the mass up to 30 %. However, the addition of phosphogypsum significantly acidifies the mass, causing the paint to lose its performance relatively quickly. Continuing the work, it was found that using a small amount of CaO in the paint mixture can produce paints that match the properties of industrial paints in terms of physical and mechanical properties: such paints have a higher whiteness, better wet cleaning resistance, the same coverage as industrial paints.

## REFERENCES

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