Titanium Dioxide \( \text{TiO}_2 \)

Titanium dioxide (\( \text{TiO}_2 \)) can be used in the creation of photoelectrodes for the production of Dye Sensitized, Perovskite and other solid state solar cells.

**Improved solar efficiency**

G24 Power offers a range of transparent and opaque colloid \( \text{TiO}_2 \) pastes with a narrow particle size distribution for improved solar conversion efficiency. These performance improvements have been verified by École polytechnique fédérale de Lausanne.

**Characteristics**

Characteristics of our \( \text{TiO}_2 \) include high anatase purity, variable light trapping characteristics with transparent or opaque coating options. Our range includes colloidal \( \text{TiO}_2 \) pastes that are aqueous based for safer handling and improved environmentally friendliness. In addition our \( \text{TiO}_2 \) pastes do not require any post TiCl\(_4\) treatment.

**Particle & pore sizes**

Tunable particle sizes from 18 – 30 nm are available upon request. Formulations can also be targeted to achieve the tunable pore volume needed for emerging solid state solar cells based on Perovskite and other light absorbers.

**Deposition methods**

Our pastes can be used in laboratory and mass-production nanoporous deposition techniques including screen printing, doctor-blading and spin coating.

**Benefits**

- Improved solar conversion efficiency*
- High purity < 10ppm of Fe, K and Na
- Crystal purity 96-98% anatase
- A range of aqueous based for safer handling
- Near zero volatile organic compounds
- Does not require any post TiCl\(_4\) treatment
- Achieve high performance using a single coating step with opaque \( \text{TiO}_2 \) colloids
- Removes the need for making mechanically weak secondary light scattering layer.

*Verified by independent tests by École polytechnique fédérale de Lausanne.
### Transparent TiO₂ – Deposition by doctor blading or spin coating

**18TA**
- **Anatase particle size**: 18-20nm
- **Concentration**: ~16% wt.
- **Medium**: Aqueous, polymeric binders
- **Acidity**: pH <1
- **Specific surface area**: 75-85m²/g

Paste containing 16% wt. of 18-20 nm titanium dioxide (TiO₂) anatase particles. The resulting layer after sintering is transparent.

**18SB**
- **Anatase particle size**: 22-25nm
- **Concentration**: ~16% wt.
- **Medium**: Aqueous, polymeric binders
- **Acidity**: pH <1
- **Specific surface area**: 65-75m²/g

Paste containing 16% wt. of 22-25 nm titanium dioxide (TiO₂) anatase particles. The resulting layer after sintering is transparent.

**18OS**
- **Concentration**: ~16% wt.
- **Medium**: Aqueous, polymeric binders
- **Acidity**: pH <1
- **Specific surface area**: 60-70m²/g

### Opaque TiO₂ paste for applications that do not require transparency.

**22TB**
- **Scatter particle size**: >150nm
- **Medium**: Aqueous, polymeric binders
- **Acidity**: pH <1
- **Specific surface area**: 50-60m²/g

Paste containing 16% wt. of 22-25 nm titanium dioxide (TiO₂) anatase particles mixed with larger scattering titania particles.

**22OS**
- **Concentration**: ~16% wt.
- **Medium**: Aqueous, polymeric binders
- **Acidity**: pH <1
- **Specific surface area**: 50-60m²/g

Paste containing 16% wt. of 22-25 nm titanium dioxide (TiO₂) anatase particles mixed with larger scattering titania particles.

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**Deposition Method**

- **Doctor blading, spin coating**
- **Screen printing**
**Titanium Dioxide TiO₂**

### Transparent TiO₂ – Deposition by screen printing

<table>
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</tr>
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Paste containing 18% wt. of 18-20 nm titanium dioxide (TiO₂) anatase particles. The resulting layer after sintering is transparent.

Transparent TiO₂ paste for applications that require a transparent sintered titania film with a large surface volume ratio.

### Opaque TiO₂ – Deposition by screen printing

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</tr>
</tbody>
</table>

Paste containing 18% wt. of 22-25 nm titanium dioxide (TiO₂) anatase particles mixed with larger scattering titania particles.

Opaque TiO₂ paste for applications that do not require transparency.

### Available sizes

Titanium dioxide (TiO₂) pastes are available in 10g, 20g, 50g, 100g, 200g, 500g and 1kg batches available as standard. Bulk sizes also available upon request.

### Customized particle sizes

G24 Power can also accommodate requests for the manufacture of Titanium Dioxide (TiO₂) with customized particle sizes from 18-30nm.

### Other metal oxides

Available on request - other metal oxides and nanomaterials manufactured by hydrothermal process to customer specification, including Aluminium oxide (Al₂O₃) and Zirconium oxide (ZrO₂).