Masking the whitening effect of titanium dioxide (TiO_2) in foundations and sunscreens on darker skin tones is a common challenge. TiO_2 is a popular ingredient in these products due to its excellent UV-blocking properties, but it can leave a noticeable white or ashy cast on darker skin. Here are some strategies used in the formulation to address this issue.

Micronisation is the process of reducing the particle size of TiO_2 to a micron or submicron level to help minimise the whitening effect. Smaller particles are less visible on the skin, reducing the white cast. Nano-sized particles of TiO_2, which are even finer, are used in some formulations, making the product more transparent.

Tinted formulations using added pigments that match darker skin tones to the formulation can help counterbalance the whiteness of TiO_2. These pigments can include iron oxides or other colourants that blend seamlessly into the skin. Some products use a more sheer or transparent base that allows the TiO_2 to blend better with the skin without leaving a white cast. **Transparent iron oxides** at very low dosage levels make a visible difference.

TiO_2 can be encapsulated in materials that are more skin-friendly or that blend better with darker skin tones. This can help prevent the pigment from sitting on top of the skin and creating a whitening effect.

Zinc oxide (ZnO), a UVA blocker, has a smaller particle size than TiO2, a UVB blocker, and for broad-spectrum sunscreen protection, these are often combined and can be balanced to minimise the white cast. ZnO can also be used as the only sunscreen agent in sunscreen formulations. Comprehensive information can be found on the **Sunscreen Technologies** page.

Incorporating certain oils and emollients can help the product spread more evenly and absorb better into the skin, reducing the appearance of whiteness.

Advanced emulsification techniques can help disperse TiO_2 more evenly throughout the product, which can reduce the visible white cast. Kobo’s treated titanium dioxide and zinc oxide powders and dispersions enhance homogeneity.

Some formulations include optical diffusers that reflect light in a way that minimises the appearance of a white cast on darker skin tones.

Brands are increasingly testing their products on a wider range of skin tones to

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ensure that the formulations are inclusive. Products that pass these tests are more likely to blend well on darker skin without a whitening effect.

In some cases, formulators may use organic UV filters instead of or in combination with TiO_2 and ZnO. These are called hybrid sunscreens. Filters based on organic sunscreens only do not have the whitening effect, but they may not be suitable for all skin types and could be extremely oily, especially for high SPF protection. **Encapsulated organic filters** and **oil-absorbing powders** will reduce the oily appearance.

A combination of the various techniques can help create products that provide UV protection without leaving an undesirable white or ashy appearance on darker skin tones.

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