



## PRODUCTION OF CERAMIC DECORATIVE LAYERS USING LASER PROCESSES

### Task

Apart from the annealing and glaze firing process required to manufacture the base ceramics, decorated tableware and sanitary ceramic products require an additional firing to apply the decorative finish. The decorative finish is fired at temperatures > 700 °C in continuous furnaces with a high thermal mass and is therefore extremely energy-intensive. In order to drive down the high costs in the industry and make a substantial contribution to climate protection, the aim is to develop an energy-efficient laser process that limits the area to be heated to a thin edge zone by precisely controlling the spatial and temporal characteristics of the laser radiation.

### Method

Close collaboration with coating material manufacturers for the decorative industry enables the laser process and the coating material to be coordinated. This material is applied, for instance, by means of spraying or pad printing. Fraunhofer ILT's remit is to tailor specifically the characteristics of the laser-induced temperature distributions (e.g. heating/cooling rates, temperature hold times, temperature penetration depths, etc.) so that the firing temperatures required for the particular coating material are achieved in an energy-efficient manner without damaging the glazing components and pigments involved.

*1 Black decoration fired using laser process on a glazed porcelain plate (Ø 15 cm).*

*2 Laser treatment with linear intensity profile.*

### Result

By implementing a quasi-linear processing strategy, the researchers have managed to convert the applied particulate coating materials into a homogeneous, superficially sealed coating and thus generate black decorations on glazed porcelain.

### Applications

The direct application area relates to decorating tableware and sanitary ceramic products. However, the developed laser process can also be used to generate ceramic wear protection layers, thus opening up an additional application wherever surfaces need to be protected against wear.

### Contacts

Dipl.-Phys. Dominik Hawelka  
Phone +49 241 8906-676  
dominik.hawelka@ilt.fraunhofer.de

Dr. Jochen Stollenwerk  
Phone +49 241 8906-411  
jochen.stollenwerk@ilt.fraunhofer.de