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Photonic sintering of BaZrO3-based proton conductors

Conventionally, ceramics are densified by sintering in a furnace, a time-consuming and energy-intensive process. Several advanced sintering technologies such as FAST-SPS, UHS, and photonic sintering have been developed to improve the sintering process. For photonic sintering, ceramics are directly heated with a light source (e.g., a blue laser) enabling rapid heating rates of up to several 100 K/s reducing the overall sintering time. This is especially of interest for acceptor-doped BaZrO3, a proton conductor, which is challenging to sinter conventionally. BaZrO3 is sintered at high temperature (~ 1600 °C) for extended periods (~ 24 h). This leads to unwanted BaO evaporation, which has a negative impact on the microstructure and functional properties.

In the present study, the sintering behavior of acceptor doped BaZrO3 during photonic sintering is investigated. The influence of different parameters, such as heating rate, sample geometry, and substrate type, on power demand , shrinkage rate and material properties is explored. As the laser power is controlled by the temperature measurement of a pyrometer, power demand and temperature are easily documented. Furthermore, synchronized video documentation allows the determination of the shrinkage rate as well as a quick assessment of the sintering behavior during the process enabling efficient adjustments . The sintered samples' phase composition, microstructure and functional properties were characterized by XRD, SEM and EIS.

Professional Status of the Speaker

Doctoral or Master Student

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

No

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