

TABLE OF CONTENTS

ANNUAL REPORT 2019/20

2 Foreword

4 Table of contents

Fraunhofer IKTS in profile

6 Portrait

8 Core competencies

10 Organizational chart

12 Fraunhofer IKTS in figures

15 Board of trustees

16 The Fraunhofer-Gesellschaft

17 Retrospective

22 Highlights from our business divisions

Materials and Processes

24 Layered perovskites for texturing of lead-free piezoceramics

25 Superfast plasma ALD with 3D-printed ceramic rocket nozzles

26 Material jetting – thermoplastic 3D printing for multimaterial parts

27 Functionalized transparent yttrium-aluminum-garnet ceramics (YAG)

28 Energy-efficient two-step sintering of ZTA-ceramics

Mechanical and Automotive Engineering

29 Ceramic mold inserts for injection molding

30 Interchangeable ceramic heads for single-lip deep drilling

31 Safe storage for hydrogen and gas in pressure vessels

Electronics and Microsystems

32 Thick-printed copper pastes for power electronics

33 In-situ detection of cracks in microchips by nano-XCT

34 Micromechanics of silver-sintered interconnects in power electronics

Energy

35 Process development for the decommissioning of nuclear installations

36 Ceramic electrolytes for lithium and sodium solid-state batteries

38 Solid-oxide CO-electrolysis as a key technology for CO₂ utilization

40 Cost-effective hot-side interconnects for thermoelectric generators

- 41 Efficient design tools and coating processes for lithium-ion battery electrodes
- 42 Seasonal heat storage system with bodies formed out of zeolites

Environmental and Process Engineering

- 43 Nutrient recycling from organic residue materials
- 44 Ceramic hot gas filters for the recovery of reusable materials and gas cleaning
- 45 Efficient CO₂ recovery from industrial emissions through membrane separation
- 46 Desalination of high salinity solutions with membrane distillation processes

Bio- and Medical Technology

- 47 Microfluidics for aptamer-based biosensors
- 48 Biomaterial testing 2.0 – standardized, resource-efficient: ClickKit-Well
- 50 Ceramic bonepreserver – ceramic resurfacing prosthesis for the hip joint

Water

- 51 Circulation water treatment of critical printing colors with ceramic membranes
- 52 Treatment of complex industrial process waters with high salt content
- 53 Comparative long-term investigation of pesticide removal technologies
- 54 Online micropollutant analysis system for efficient waste water treatment
- 55 How does plastic age? Investigations in the lab and the Pacific Ocean

Materials and Process Analysis

- 56 Measuring dynamic fatigue in corrosive media
- 57 Flexible 4-point bending system for tensile and compressive loading
- 58 Deformation analyses under isostatic pressure loading
- 59 In-situ and operando structural investigations of electrochemical systems

Non-destructive testing and monitoring

- 60 Automated ultrasonic testing of thin metal sheets using PCUS® PRO HF
- 61 Monitoring of the extrusion process in the production of battery tapes
- 62 Wireless sensor systems for safe offshore structures – CoMoBelt

63 Cooperation in groups, alliances and networks

69 Names, dates, events

- 70 Events and trade fairs in 2020
- 72 How to reach us