Large $KTiOPO_4$ crystal hydrothermally gown from 27 L-autoclave for electro-optical application

Haitao Zhou[1,2]*, Xiaoling He[1,3], Wenyuan Wu[1,3], Jingfang Tong[1], Zhengzhong Deng[1] JinliangWang[1], Yanbin Zuo[1], Yicheng Wu[2], Changlong Zhang[1,3], Zhanggui Hu[2]
*lead presenter: zhouht@aliyun.com
1 Guangxi Key Laboratory of Superhard Materials, China Nonferrous Metals (Guilin) Geology and Mining Co., Ltd, China
2 Tianjin Key Laboratory of Functional Crystal Materials, Institute of Functional Crystals, Tianjin University of Technology, China
3 Guilin Bairay Photoelectric Technology Co., Ltd, China

The EO performance of KTP was recognized as soon as it was discovered, but after more than 40 years of development, the reports, and products of EO devices based on KTP are less than those of other EO crystals, even though KTP is now almost the cheapest nonlinear optical crystal material. Three problems hinder the EO application of KTP: the crystal size, electro-chromic effect, and optical inhomogeneity. We think that crystal growth is the most important reason that affects the control ability of crystal performance, then we realize the growth of large-size KTP crystals with high-optical uniformity, low absorption level with resistance to electric damage and laser damage. Reducing the conductivity and improving the uniformity of optical, electrical, piezoelectric, and ferroelectric properties of KTP are emphasized. The typical size of the grown crystal is 70 × 70 × 40 mm3 (x, z, y) and ten crystals produced in an autoclave with an inner diameter of 90 mm a volume of 5 L at once. Now, for Φ 120 mm × 2.4 m autoclave, crystals of the above size can be grown reaching to 32-40 pieces, with a total weight of about 10 kg. Then, we test the extinction ratio, piezoelectric ringing effect and thermal influence of the EO switch based on KTP crystal, and some publicly available progress of using KTP EO devices in high-repetition rate laser is listed.

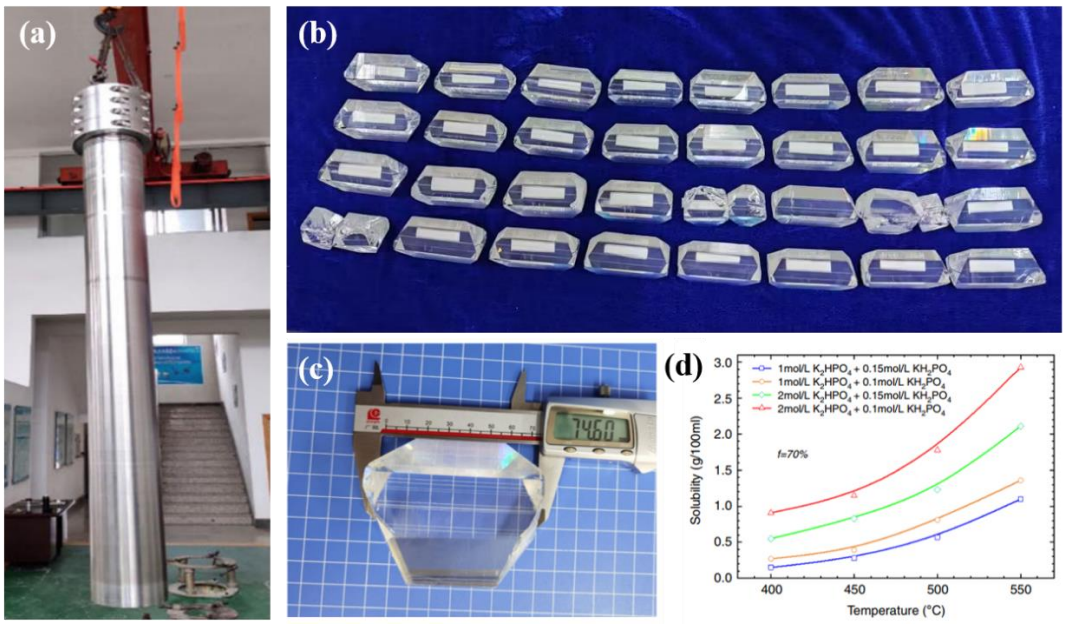

Figure 1 (a). Autoclave with effective internal dimensions of Φ120 mm diameter × 2.4 m high, (b). (c). the grown KTP crystal and (d). Solubility-temperature curve for KTP in K2HPO4 and KH2PO4 mixed solution in the range from 400 to 550 °C.