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Deubener, J.; Yue, Yuanzheng

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Optical and mechanical anisotropy of oxide glass fibers

J. Deubener[1], Y.Yue[2]

[1] Clausthal University of Technology, D-38678 Clausthal-Zellerfeld, Germany

[1] Aalborg University, DK-9000 Aalborg, Denmark

Upon fiber drawing, glass forming oxide melts are thermally quenched and mechanically stretched. High cooling rates (up to 10^6 K/min) of quenched glass fibres lead to higher enthalpy state of liquids, thereby, to higher fictive temperature than regular quenching (e.g. 20 K/min) of bulk glass products [1], whereas stretching (frozen-in strain) results in optical and mechanical anisotropy of glass fibers, which is quantified inter alia by the specific birefringence [2]. The paper will stress the later effects by combining previous results on the structural origins of birefringence and anisotropic shrinkage in silica and phosphate fibers with recent studies on relaxation of optical anisotropy in E-glass fibers [3,4].

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