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Title:Near-net shaping of single-crystal silicon for optical lens by one-shot pressing at temperature just below silicon melting point and its demonstration of optical properties

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Abstract:Silicon is brittle and easily cracks even under a small load. The difficulty in shaping silicon has prevented breakthroughs in the mass production of silicon lenses for terahertz and infrared technology. We developed a novel method of deforming bulk single-crystal silicon into the required shape by one-shot pressing and realized the near-net shaping of silicon into a plano-convex shape with the curvature radius $R = 7.5$ mm. The crystallographic quality of the obtained lens was improved by primary recrystallization. By packaging it into a practical sensor module, the suitability of the lens for practical application was demonstrated.

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