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Volume 113, Issues 3-4, September 1991, Pages 527-539

doi:10.1016/0022-0248(91)90088-M [Cite or Link Using DOI](#)  
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## Inclusions in synthetic quartz

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Received 25 February 1991; revised 1 May 1991. Available online 29 July 2002.

### Abstract

Synthetic quartz grown in steel autoclaves under standard conditions in  $\text{Na}_2\text{CO}_3$  solution (with trace Li) traps secondary phase particulates during growth. Identification of these particulates, although difficult due to small size (<5 to 100s of  $\mu\text{m}$ ), is possible using X-ray diffraction, electron microprobe, and optical microscopic techniques. Four secondary phases were identified in normally grown crystals:  $\text{Li}_2\text{Si}_2\text{O}_5$ ,  $\text{NaFeSi}_2\text{O}_6$ ,  $\text{Na}_5\text{FeSi}_4\text{O}_{12}$ , and a phase with estimated composition  $\text{Li}_6\text{Na}_6\text{Fe}_2\text{Si}_{18}\text{O}_{45}$ . The last three phases are often found together in crystals, which suggests that a stable phase assemblage for quartz growth in steel autoclaves in  $\text{Na}_2\text{CO}_3$  solution is quartz+fluid+iron oxide+ $\text{NaFeSi}_2\text{O}_6$ + $\text{Na}_5\text{FeSi}_4\text{O}_{12}$ + $\text{Li}_6\text{Na}_6\text{Fe}_2\text{Si}_{18}\text{O}_{45}$ . Quartz grown in  $\text{Na}_2\text{CO}_3$  solution with added iron also develops three accessory phases. Quartz grown in silver liners in Li-free carbonate solution traps only  $\text{NaFeSi}_2\text{O}_6$  and fluid inclusions.

**Journal of Crystal Growth**

Volume 113, Issues 3-4, September 1991, Pages 527-539

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