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Naphthalene crystals formed from propylene

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Large transparent crystals up to 2 cm in diameter and 0.1 mm in thickness have been observed to form close to room temperature in the exhaust of a unit designed for the deposition of pyrolytic carbon from a 50% propylene-50% inert gas mixture. From X-ray diffraction studies, the crystals were identified as naphthalene. Nucleation and growth of these crystals took place on the surface of a Pyrex glass tube located outside of the furnace when pyrolysis experiments were performed at 800°C and atmospheric pressure. The hot zone in the furnace was 18 in. long; the reactor tube, of mullite, was 7.5 cm in diameter. Gas passed through the furnace in laminar flow, having a residence time of about 5 min in the hot zone.

It would appear that the glass provides active sites for the nucleation of these crystals since no crystals formed on the Tygon tubing connected to the glass tube. When the hot zone was held at 850°C, there was a marked reduction in crystal formation, but a very thick grease formed further down the exhaust line on glass joining two Tygon tubes together.

The carrier gas also seemed to play a role in the rate of growth of these crystals. In initial pyrolysis experiments, N₂ was utilized as the carrier gas. In these runs at 800°C a 0.5 in. dia. glass tube would

be completely plugged up with naphthalene crystals in about 8 hr. In similar experiments using He the tube remained unplugged for up to 24 hr.

Similar crystals have been reported by Pratt *et al.* to have formed as a consequence of taking propane-He mixtures to 1100°C [1]. No crystals were observed at lower temperatures. This result is consistent with this work and that of Beatty *et al.* [2] in which propylene is considered to be one of the first pyrolysis products of propane.

The formation of naphthalene crystals is due to the incomplete pyrolysis of the hydrocarbon gas. The carrier gas seems to affect the rate at which this pyrolysis is taking place.

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