The Crystal Structure of Tetraformylethane

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cis-enol arrangement in β-diketones has recently been investigated [1,2]. These compounds prefer the *cis* arrangement with an *intra*-molecular hydrogen bond. When the terminal groups become small, as in the β-dialdehydes, the *trans*-enol form becomes more stable, at least in the solid-state, where the molecules form chains of *inter*-molecular bonds. Tetraformylethane prefers the *trans*-enolic isomer in the solid state, s. g. **Fddd**. ½ + ¼ of a molecule constitutes the asymmetric unit. 2/3 of the molecules crystallize in asymmetric *inter*-molecular hydrogen bonded chains. The pairs of chains formed by centres of inversion comprise an antiferroelectric arrangement of oppositely polarized molecules. Single and double bonds are clearly recognizable but the amount of conjugation is amazingly high. The remaining 1/3 of the molecules form chains of molecules situated on the intersection of three twofold axes, rendering single and double bonds indistinguishable. These molecules are connected by *inter*-molecular hydrogen bonds across centres of inversion with hydrogen bond distances slightly shorter than that of their asymmetric counterpart. The crystal structure was originally solved in a cell with an a-axis 1/3 of that in the present study (also in **Fddd**). Photographic and difractometric studies revealed the tripling of the a-axis. We venture to call the strange arrangement found “frustrated antiferroelectric”.

[1]Herbstein F., Iversen B.B., Larsen F.K., Madsen G.K.H. Reisner G.M., *Acta Cryst*., 1999, **B55**, 767-787. [2] Lyssenko K.A., Lyubetsky D.V., Antipin M. Y., *Mendeleev Comm. Electronic Version*, 2003, **Issue 2**, 1-3

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