

LETTER TO THE EDITORS

SINGLE CRYSTAL GROWTH OF TRIGLYCINE SULPHATE (TGS) IN SILICA GEL

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Single crystals of triglycine sulphate upto 11 mm × 7 mm × 3 mm in size have been grown in silica gel at room temperature. Experimental technique, studies on nucleation and growth characteristics and morphology of grown crystals are reported. It has been found that when pH of the gel is 2.5 or higher, only TGS crystals are formed and for pH between 2 and 2.4 both TGS and DGS (diglycine sulphate) crystals are formed. When pH of the gel is less than 2, only DGS crystals are produced in the gel.

Several workers [1–4] have grown single crystals of TGS from an aqueous solution of the components in stoichiometric molar ratio by the cooling method. Henisch [5] has reported the method of growing TGS crystals in gel. He has not reported any other information regarding the effect of pH of the gel on the growth, morphology and nucleation of these crystals. After this the present authors have not come across any reference in the literature on the growth of these crystals in gel. The present paper reports the growth of transparent single crystals of TGS in silica gel, and the effect of altering the pH of the gel on the growth, morphology and nucleation is also presented.

The stock solution was prepared as reported by Henisch. The specific gravity of this solution was adjusted to 1.06 g/cm³. Test tubes (20 cm long and 4.5 cm in diameter) were employed as crystallization vessels. After the gel was set, methanol was added slowly above the gel and the test tubes were tightly sealed with rubber corks to prevent evaporation of methanol. This helps in decreasing the solubility of TGS which first precipitates at the gel–methanol diffusion interface. Diffusion of methanol into the gel was followed by formation of nuclei which then grew in size.

Crystals having excellent surfaces and optical clarity and upto 11 mm × 7 mm × 3 mm in size were grown in gel at room temperature (25°C).

Crystals were formed near the diffusion interface in the gel and also within the gel. The crystals produced near the diffusion interface were fewer in

number and smaller in size, whereas crystals formed in the central portion of the gel column were larger in number and size. Practically very few crystals were formed in the lower region of the gel. Fig. 1 is the photograph of crystals growing near the interface and well within the gel.

To investigate the effect of pH of the gel on the growth of TGS crystals, different values of pH ranging from 2 to 3.9 were tried. It was observed that on



Fig. 1. Photograph of crystals growing near the interface and in the gel.

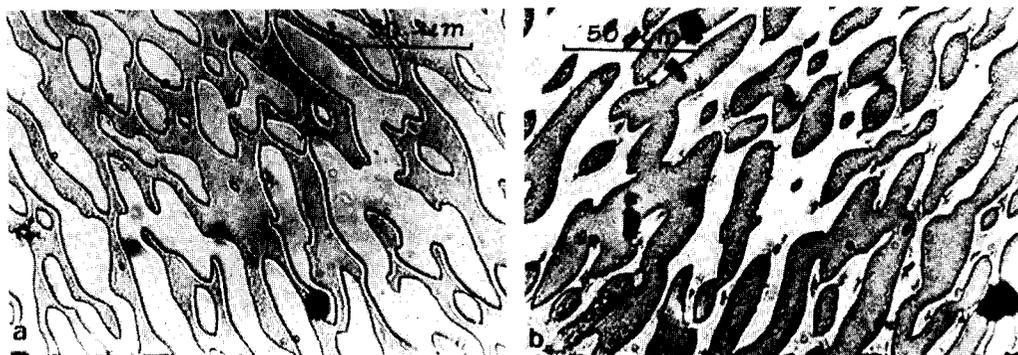


Fig. 4. One to one correspondence of domains on the matched cleavage faces.

Table 1

pH	Incubation period (h)	Remarks
2.3	48	Transparent crystals are grown; few DGS crystals are formed; most prominent habit faces are $\{001\}$, $\{100\}$, $\{110\}$
2.8	32	Transparent crystals are formed in the gel; all are TGS crystals; most prominent habit faces are $\{001\}$, $\{100\}$, $\{110\}$
3.0	24	Transparent crystals are produced. All are TGS crystals; most prominent habit faces are $\{001\}$, $\{100\}$, $\{110\}$
3.4	18	Transparent TGS crystals are formed in the gel; most prominent habit faces are $\{001\}$, $\{100\}$, $\{110\}$, $\{021\}$
3.9	7	Transparent crystals are grown; all are TGS crystals; most prominent habit faces are $\{001\}$, $\{100\}$, $\{110\}$, $\{021\}$

nents have observed that the growth of TGS and DGS crystals depends on the pH of the solution rather

than the molarity of the components used.

The DGS crystals produced were characterized by using micro-chemical analysis and X-ray techniques.

Transparent crystals of TGS upto 11 mm \times 7 mm \times 3 mm in size could be grown in gel. The growth of TGS crystals is dependent on the pH of the gel.

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References

- [1] W.W. Duley and P.J. Finnigan, *Am. J. Phys.* **41** (1973) 687.
- [2] K.N. Shrivastava and Bachan Singh, *Indian J. Pure Appl. Phys.*, to be published.
- [3] A.V. Shubnikov and N.N. Sheftal, in: *Growth of Crystals*, Vol. 3 (Consultants Bureau, New York) p. 199.
- [4] N. Nakatani, *J. Phys. Soc. Japan* **39** (1975) 741.
- [5] H.K. Henisch, *Crystal Growth in Gels* (Pennsylvania State Univ. Press, University Park, PA, 1970) p. 31.
- [6] V.P. Konstantinova, *Soviet Phys.-Cryst.* **5** (1963) 605.
- [7] G.R. Pandya and D.D. Vyas, *J. Crystal Growth* **50** (1980) 870.