

CONTRASTS IN THE CRYSTALLIZATION OF NICKEL AND COBALT PHOSPHATES IN SILICA GELS.¹—Nickelous and cobaltous salts frequently are isomorphous and can, with the exercise of reasonable care, be expected to produce identical-anion crystals of approximately similar size, despite the propensity of Co^{++} salts sometimes to be difficult to crystallize.

The purpose of this note is to report a quite remarkable, most interesting, and not altogether unexpected contrast that has been observed in the crystallization of nickel and cobalt phosphates in acidic silica gels. Initially identical gels, prepared by adding 50 ml of 1.066 sp. gr. "N" sodium silicate solution to 50 ml of an aqueous solution containing 50 milliequivalents of acetic acid and 75 milliequivalents of $(\text{NH}_4)_2\text{HPO}_4$ (25 milliequivalents of H^+ and 50 milliequivalents of NH_4^+), were reacted, respectively, with 40 milliequivalents of $\text{Ni}(\text{NO}_3)_2$.

Figure 1 is a reproduction of a photograph of the gels after completion of the reaction. The gel at the left in Figure 1 was reacted with Ni^{++} ; long, slender, bright apple-green monoclinic crystals were formed. These crystals, up to 1 inch in length, were apparently of a nickel phosphate. Near the top of the gel,

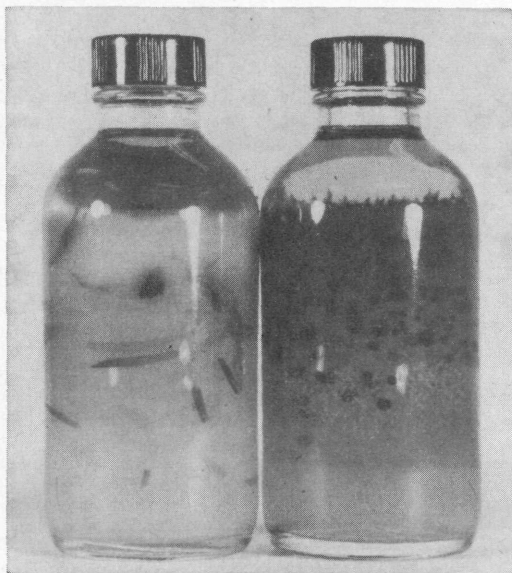


FIGURE 1. Long crystals of a nickel phosphate and spherulites of a cobalt phosphate formed in acidic silica gels.

the crystals are multiply twinned, showing both parallel twinning and spherulitic twinning, and are longer than subsident crystals. Near the bottom of the gel are simply-twinned crystals and a few growths that appear to be single crystals. Most of the crystals in the lower half of the gel do not exceed $\frac{1}{2}$ inch in length and near the bottom the crystals do not exceed $\frac{1}{4}$ inch in length. The distribution of the crystals is random. The top surface of the gel contained a fine powdery pale green adherent precipitate and the top $\frac{1}{2}$ inch of the gel was likewise beclouded with a "fog" of very tiny pale green particles. However, this fog clears very slowly, and 10 months after the start of the experiment has faded to a haze. The supernatant liquor is very faintly green. The photograph reproduced in

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Figure 1 was taken about 6 months after the start of the experiment and shows considerable "fog" near the top of the gel.

The gel shown at the right was reacted with Co^{++} and produced strikingly different results. The top surface and the upper $\frac{1}{4}$ inch of the gel contains a multitude of small coherent conglomerated reddish-purple spherulites of a cobalt phosphate. No aggregates are loose in the supernatant liquor, which is a pale pink in color. Below the surface and subsurface conglomerate band and extending to within $\frac{3}{4}$ inch of the bottom of the gel are randomly distributed reddish-purple spherulites ranging in diameter from $\frac{1}{2}$ inch to $\frac{1}{8}$ inch, most being at least $\frac{1}{16}$ inch across. In the gel below the top band, some of the closely adjacent spherulites are joined in dumbbell-like fashion and there are a few conglomerates consisting of three or more variously sized spherulites.

It is not known which particular phosphates the green crystals and the reddish-purple spherulites are. They may well be acid phosphates or metal-ammonium phosphates. The literature on nickel and cobalt phosphates is sparse indeed.

In other experiments, Ni^{++} and Co^{++} were incorporated in identically acidic gels and $(\text{NH}_4)_2\text{HPO}_4$ was used as the external reactant over the gels. These produced results very similar to those described above; the nickel phosphate grew in long, apple-green crystals and the analogous cobalt compound formed spherulites.

These results offer the double challenge of further work in gels concerned with (1) trying to cause the nickel phosphate to grow as spherulites and (2) trying to prevent spherulitic growth of the corresponding cobalt salt and encouraging its formation as sizable crystals.—PHILIP F. KURZ, *Battelle Memorial Institute, Columbus, Ohio 43201*.

Pure Cultures of Algae. *E. G. Pringsheim.* Hafner Publishing Company, New York. Reprinted by arrangement. 1964. xii+119 p. \$3.00.

The reprinting of the first edition, originally published by Cambridge University Press in 1949, will be welcomed by those unable to obtain the original edition. This book needs no introduction to those who use the original as a standard reference for the culture of algae. Those unfamiliar with the book will find pertinent information that concerns the selection of algae, equipment, media, and techniques useful in their culture. The widely used soil-water and bacteria-free culture techniques are as valuable for researchers who use algae as a tool, as for the phycologist whose primary interests are the algae per se.

Though new techniques and modifications of existing techniques are continually being devised, this book with an extensive bibliography remains a valuable contribution in its field.

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A Source Book in Geology. *Kirtley F. Mather and Shirley Mason.* Hafner Publishing Company, New York. 1964 (reprint of 1939 ed.). xii+702 p. \$10.75.

This is a reprint of one of a series of source books on various sciences. It consists of a collection of selected excerpts, in English, of classics in geology, ranging from the time of Leonardo da Vinci to about 1900. As might be expected, some reviewers of the original edition pointed out the omission of selections that they felt should have been included, and, according to his own background and speciality, a reader may still note the absence of certain items he considers important. However, the selection has been most carefully made and offers a well-balanced survey of the growth of knowledge of geology.

At present a growing interest exists in the history of science, both as a discipline in itself and as a means for better understanding of the individual science. This collection offers a sampling of geology which may entice the reader into more extensive reading of the original contributions upon which the principles and philosophy of the science are based and thereby greatly enrich his understanding of the subject.

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