

described by Zincken (1829), Cissarz (1930), and Schneiderhöhn and Ramdohr (1931) is almost certainly not a simple palladium amalgam.

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REFERENCES

1. AZAROFF, L. V., AND BUERGER, M. J. (1958), *The Powder Method in X-Ray Crystallography*: New York, 234-235.
2. BERZELIUS, J. J. (1813), *Kongl. Vetensk. Acad. Handl. Stockholm*, **33**, 175-215.
3. BITTNER, H. AND NOWOTNY, H. (1952), *Monatsh Chem.*, **83**, 287-289.
4. CISSARZ, A. (1930), *Zeit. Kr.*, **74**, 501-510.
5. HARRISON, J. B. (1924), *Official Gazette of British Guiana*, **57**, 212-213.
6. HARRISON, J. B. AND BOURNE, C. L. C. (1925), *Official Gazette of British Guiana*, **59**, 66-68.
7. HORSFORD, E. N. (1852), *Am. J. Sci.* **2**, **13**, 305-318.
8. PALACHE, C., BERMAN, H., AND FRONDEL, C. (1944), *The System of Mineralogy of James Dwight Dana and Edward Salisbury Dana, Yale University 1837-1892*, Vol. I, Seventh Edition, New York, 105.
9. PEACOCK, M. A. (1945), *University of Toronto Studies, Geol. Ser.*, **49**, 71-73.
10. SCHNEIDERHÖHN, H. AND RAMDOHR, P. (1931), *Lehrbuch der Erzmikroskopie*, Vol. 2, Berlin, 50.
11. SPENCER, L. J. (1928), *Min. Mag.*, **21**, 397-406.
12. ZINCKEN, C. (1829), *Ann. Phys. Chem. (Poggendorff)* **16**, 491-495.

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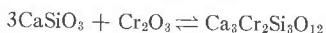
A NOTE ON SO-CALLED "PRESSURE INDEPENDENT" MINERALS

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In a recent note on the stability and synthesis of uvarovite, $3\text{CaO} \cdot \text{Cr}_2\text{O}_3 \cdot 3\text{SiO}_2$, Glasser (1959) objected to a statement by Hall (1958) which tended to give the impression that uvarovite, like diamond, is

stable only at pressures of the order of 20,000 to 35,000 bars. Glasser then went on to state: "Uvarovite—and several other members of the garnet series mentioned by Hall—are 'pressure independent' minerals, inasmuch as they also have a thermodynamic stability range at 1 atm. pressure. Hall was apparently unaware of the work of Hummel," (1950) who succeeded in preparing uvarovite at 1 atm. pressure and between 885° and 1400° C.

It should be pointed out, however, that the term "pressure independent mineral" is highly misleading in this context, since it implies that the stability field of such a mineral is actually independent of pressure, something which can only be the case when the phase boundary delineating the stability field of such a mineral in the P-T plane—in the case of uvarovite the phase boundary expressed by



is a straight line parallel to the pressure axis, *i.e.* with dP/dT infinite. The requirement for this to happen is that ΔV for the reaction be zero, while ΔS be unequal to zero. This is certainly not true for the above reaction, and is, in fact, an extremely rare occurrence for reactions such as the one above or ordinary first-order transitions. Actually, the phase boundary under discussion may be expected to intersect the T-axis at $1370^\circ \pm 10^\circ$ C. (4) and to have a positive slope in the P-T plane, since the garnet is the denser assemblage.

As any geologist knows, geological nomenclature abounds with misnomers, and it would be unfortunate if another is unnecessarily added. One certainly is not justified in ascribing the term "pressure independent" to a mineral merely because it has a thermodynamic stability range at 1 atmosphere.

It is hoped that these remarks will in no way detract from the main point of Glasser's note, with which the present author is completely in agreement.

REFERENCES

1. GLASSER, F. P. (1959), On the stability and synthesis of uvarovite, *Ca}_3\text{Cr}_2\text{Si}_3\text{O}_{12}, *Am. Mineral.*, **44**, 1301-1303.*
2. HALL, H. T. (1958), Ultrahigh-Pressure Research, *Science*, **128**, (3322), 445-449.
3. HUMMEL, F. A. (1950), Synthesis of uvarovite, *Am. Mineral.*, **35**, 324-325.
4. GLASSER, F. P., AND OSBORN, E. F. (1958), Phase Equilibrium Studies in the System $\text{CaO}-\text{Cr}_2\text{O}_3-\text{SiO}_2$, *Jour. Amer. Ceramic Soc.*, **41** (9), 358-367.