THE AMERICAN MINERALOGIST, VOL. 43, JULY–AUGUST, 1958

THE SO-CALLED "OXYGEN EXCESS"

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In view of discussions which arose at the annual meeting of the Mineralogical Society of America (Atlantic City, New Jersey, November 1957), coupled with the recent usage of the term in the *Mineralogical Magazine*, it seems appropriate to comment on the misleading expression "oxygen excess."

This so-called "oxygen excess" has been erroneously interpreted to mean, rather than a deficiency of smaller interstitial cations, exactly what the term implies, an excessive number of oxygen atoms occurring in a particular structure. Except in unusual situations which require special elucidation, "excess" oxygens do not exist in structures composed of fairly closely packed oxygen atoms.

It would seem axiomatic, for example, from the symmetrical requirements that a garnet structure cannot contain 99 oxygen atoms instead of 96. Nevertheless, it has been claimed that $12CaO \cdot 7Al_2O_3$ exists in "solid solution" with grossularite. Here, a portion of the failure in semantics probably stems from the term, "solid solution." Were one discussing a *glass*, for which "solid solution" would be most appropriate terminology, no such enigma as the assignment of 99 large anions (oxygens) to 96 equivalent points of a symmetrical lattice would arise, because of the known irregularities of glassy substances.

However, the problem at hand is quite simple. If, indeed, some substance composed of CaO and Al_2O_3 is isostructural with $Ca_3Al_2(SiO_4)_3$—and such a substance may exist—its correct composition cannot be represented by $12CaO \cdot 7Al_2O_3$ (actually $3[Ca_{12}Al_{14}O_{33}]$) because three additional oxygens cannot be placed in this structure without destroying the essential symmetrical arrangement required by *Ia3d*.

Such vague, illusive terminology as "oxygen excess" and "solid solution" should be abandoned in favor of *cation deficiency* and *isomorphic variant* in connection with description of silicates and related structures.

Alexander Newton Winchell died June 7, 1958. Professor Winchell was president of the Mineralogical Society of America in 1932, and received the Roebling Medal in 1955. A memorial will appear in the March-April, 1959 issue of the *American Mineralogist.*

S. J. Thugutt, emeritus professor of Warsaw University, died at Krakow, December 27, 1956, aged 95. Volume 20 (1957) of Archiwum Mineralogiczne is dedicated to him.