

**SiO₂ EXSOLUTION AND PRECURSOR SUPERSILICIC PYROXENE REVISITED,
AND A POTENTIAL NEW UHPM END-MEMBER: "SUPERSILIPYX"**

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Supersilicic pyroxene in the form of needles of SiO₂ exsolved from omphacite was first recorded in an eclogite from Rendelven in S.E. Greenland by Smith & Cheeney (1980) and was deduced to indicate very high pressure there (a new UHPM province, if not the first). Subsequently the same texture was found in a "deduced-coesite" eclogite from Essdalen, S.W. Norway by Smith (1984) and was thus related to the Norwegian coesite-eclogite-province, and hence to UHPM. In Smith (1984, 1988) the two provinces were argued to be the same Caledonian province. Since then, exsolved SiO₂ needles have been discovered by many workers at various localities, and most recently in Slovenia (Janák et al., 2004). Instead of the usual quartz, Zhang et al. (2005) also found relict coesite which nicely confirms in nature the correspondence of supersilicic pyroxene and coesite P-T conditions already established by experiment (e.g. Mao, 1971, Gasperik, 1985). The question of how a pyroxene can be supersilicic has been frequently mentioned and the general consensus has always been a deduced exsolution from "Ca-Eskola's molecule" (Ca-Es) $\{^{viii}\#_{0.5} \text{Ca}_{0.5} \text{Al}^{iv} \text{Si}_2 \text{O}_6\}$ (where # = vacancy), which could give 1.5 SiO₂ + 0.5 $\text{Ca}^{viii} \text{Al}^{iv} \text{Al}^{iv} \text{SiO}_6$ (Ca-Ts) (Ca-Tschermak's pyroxene) (Smyth, 1980). This necessarily increases the "tschermakitic" substitution in the residual pyroxene. Since the natural residual pyroxene is often an almost stoichiometric omphacite, it is suggested here that this is not the only possible solution.

Supersilicic was defined by Smith (1982) by $S > (N+D)$, and subsilicic by $S < (N+D)$, with respect to the SA(ND) triangular diagram (where $S = \text{Si}$, $A = \text{Al} + \text{Fe}^{3+} + \text{Cr} - \text{Na}$; $N = 2\text{Na}$; $D(\text{divalents}) = (\text{Ca} + \text{Mg} + \text{Fe} + \text{Mn})$) which had been especially conceived (Smith, 1976) in order to force jadeite to plot with diopside and all other stoichiometric pyroxenes except (Ca, Mg, Fe, Mn)-Ts, i.e. where $(N+D)=S$ and $A = \text{zero}$. The diagram has been updated into the SHA(ND) tetrahedron (Smith, 2005, this conference) to include rutile, Li-, K-, Ni- or Mn³⁺-pyroxene, majorite, Na-P garnet, protons and a new hypothetical inosilicate end-member C2/c pyroxene described here and called: "supersilipyx" $\{^{viii}\# \text{Al}^{iv} \text{Si}^{iv} \text{Si}_2 \text{O}_6\}$. This mineral, which is not a tectosilicate like coesite or stishovite, is highly unlikely to be able to exist alone, but in solid-solution in a multicomponent omphacite it would only need a few octahedral ^{vi}Si atoms (as known to exist in majoritic garnet) and an equal number of M2 vacancies (as recognized in Ca-Ts). Decompression of a supersilicic pyroxene (i.e. a solid-solution of "supersilipyx" + stoichiometric omphacite) will lead to exsolution of pure SiO₂ as coesite or quartz without increasing the tschermakitic component of the residual pyroxene host phase. Subsilicic pyroxene is not possible for various reasons (over-charged or over-occupied M2 ± M1, under-occupied tetrahedra) unless Si is replaced by AlH or MgH₂ or H₄. These could be ways of introducing protons into pyroxene, known since Rossman & Smyth (1990), but these crystal-chemical mechanisms are more interesting in garnet (Smith, 2005, this conference).