transmission could be indicative of an increased influence of anthropogenic contaminants on the Earth's radiation budget.

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Anionic Species of Fe in Interstellar Dust

A CRYSTAL-FIELD assignment for the 17,500 cm^{-1} (5700 Å) and 19,700 cm^{-1} (5100 Å) bands in absorption spectra of Type I supernovae would support the contention that 6 of the 8 prominent supernova bands (and their diffuse interstellar[1] wavelength-equivalents) have been "parcelled" and assigned correctly to d–d transitions in tetrahedral-Fe^{3+} and octahedral-Fe^{3+}. It had been assumed earlier that octahedral- and tetrahedral Fe^{3+} ions are incorporated in the same oxide[2] (γ-Fe_2O_3) or silicate[3] (schorlomite) lattice. Here, I point out that interstellar dust may contain anionic species of Fe, namely FeO_4^{2-} and FeO_2^-, which are thermally degradable to a likely interstellar material α-Fe_2O_3. (Absorption bands are designated according to their wavelengths in the May 4 spectrum[4] of SN-NGC-4496.)

The solution spectrum[5] of FeO_4^{2-} shows two overlapping bands centred at 17,800 cm^{-1} and 19,700 cm^{-1}, in striking coincidence with the 17,500 cm^{-1} and 17,700 cm^{-1} supernova bands. The FeO_4^{2-} ion is purple in solution and in the solid state, so the spectra are expected to be similar. Oscillator strengths for the FeO_4^{2-} transitions ($\sim 10^{-2}$) are considerably greater than for the $^6A_1 \rightarrow {}^4A_1{}^4E(G)$ transitions responsible for the 4400 Å Fe^{3+} bands[2,3] in schorlomite ($f \sim 3\times10^{-5}$) and haematite ($\sim 10^{-3}$). The 800–1,000 cm^{-1} half-widths of the two supernova bands, when compared to the $\sim$5,000 cm^{-1} half-width of the FeO_4^{2-} envelope, suggest low dust temperatures, probably <77 K.

Thermogravimetric analysis[6] has shown that K_2FeO_4 is degraded at 500–600 K in air according to two possible reactions.

$$2K_2FeO_4 \rightarrow 2KFeO_2 + 3/2O_2 + K_2O \quad \text{wt. loss } 12.1\%$$
$$2K_2FeO_4 \rightarrow Fe_2O_3 + 2K_2O + 3/2O_2 \quad \text{wt. loss } 12.1\%$$

No further loss in weight is observed up to 1,100 K. Differential thermal analysis has shown that α-Fe_2O_3 is formed at $\sim$800 K, and accordingly $KFeO_2$ was postulated as an intermediate in the degradation of FeO_4^{2-} to α-Fe_2O_3. An intermediate compound was isolated but not thoroughly characterized. $KFeO_2$ has a cristobalite structure[7] in which all Fe^{3+} ions are tetrahedrally coordinated. Octahedral-Fe^{3+} bands at 6180 Å and 4430 Å are the strongest diffuse interstellar bands, whereas in supernovae spectra[4,8] the 5100 Å bands are often at least as intense. It seems that the grains responsible for supernova absorption, in contrast to the diffuse interstellar grains, have not been heated sufficiently in a reducing atmosphere to convert FeO_4^{2-} to α-Fe_2O_3.

The laboratory preparation[9] of ferrate(VI) requires highly-oxidizing conditions, for example, in Fe/KNO_3 melts or by the action of Cl_2 on alkaline suspensions of $Fe_2O_3.nH_2O$, conditions that preclude its formation in interstellar space dominated by hydrogen. Ferrate could condense during the expansion phase following supernova explosion; alternatively ferrate could form in the atmospheres of oxygen-rich stars and then be ejected into space. Significantly, Type I supernovae are associated[10] with old stars, probably deficient in hydrogen. Local oxidizing conditions are indicated by the presence of Fe^{3+} ions in dust.

The duration of the rise[11] in brightness is $\sim$100 day and the absorption bands appear usually a few days after maximum. The narrowness of the bands and indicated low temperatures of the Fe-bearing dust are inconsistent with condensation from hot supernova shells. Calculations[12] show that 100 day is too short a time for condensed grains to cool to $\sim$77 K. The temperatures of circumstellar grains are determined[13] by the balance between the rate of absorption of energy at optical and that re-radiated at infrared wavelengths. It is possible that cold, mantled grains existed before the supernova and that the increase in grain temperatures arising from the absorption of light is sufficient to evaporate mantles of, for example, solid H_2. Racah B-parameters[14] suggest increasing temperatures for supernova dust. The maximum distance of the circumstellar grains from the star is 100 light day, at which distances from old cool stars grain temperatures may be close to 3 K.

FeO_4^{2-} gives a better wavelength fit[14] than Mn^{3+} to the 5100 Å and 5700 Å supernova bands. Both ions indicate, from the narrowness of supernova bands, low dust temperatures. The strong points of the present hypothesis are that all supernova bands can be assigned to Fe and that at least two absorbing species are thermally related.

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Microearthquake Survey of the Mid-Atlantic Ridge

THE association of earthquakes with the axis of the Mid-Atlantic ridge is well known[1–4], and it has been realized th where a median valley existed, the pattern of epicentres str d it[5,6]. The first motions and distribution of earthquakes along