



Compressional Wave Velocities in Fe-Ni-Si Melts to 1650 °C: Contrasting Results Compared to Fe-Ni-S Melts

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Using high-precision ultrasonic interferometry technique we have measured V_p in three molten Fe-Ni-Si alloys containing varying amounts of Fe (75-89 wt % Fe), 5 wt % Ni, and Si (6-20 wt %) in the T range 1190-1650°C and in the frequency range 9-13 MHz. The temperature dependencies of V_p for all the compositions are linear and negative, and no dispersion (within experimental errors) is observed in the temperature and frequency ranges of the experiment. However, at a given temperature, an increase in Si content causes an increase in V_p , and an increase in the $(-\partial V_p / \partial T)$ value.

The results for the Fe-Ni-Si melts are also compared with those obtained previously for Fe, Fe-Ni and Fe-Ni-S melts. Whereas in the Fe-Ni-Si melts, addition of S was observed to cause anomalous elastic behavior $(+\partial V_p / \partial T)$, the behavior in Fe-Ni-Si is normal. The contrasting results may be explained in light of the structural differences in the S- and Si-containing Fe-Ni melts. The results may provide useful constraints on the Earth's outer core composition.