THEORY OF NEO'S AERODYNAMIC HEATING FROM MOLECULAR COLLISION ANALYSIS

As soon as NEO enters earth's atmosphere, It'll be at hypersonic speed where there exists high transfer rates in the interaction region, especially when there is separation. Consequently there will be high (average) stagnation pressure, where transfer processes are much more efficient, hence higher heat transfer levels.

Using molecular collision analysis an aerodynamic heating model is derived, In which the rising temperature of hypersonic near earth objects is used as a function of the flying speed in a classical dense monoatomic gas environment setup. Research has predicted that the rising temperature of the hypersonic flying object is independent of the gas density but depends linearly on gas atomic mass, using the same concept disintegration of meteoroid dependency on it is defined.

A non equilibrium molecular dynamics simulation is carried out to verify the theoretical model, The model is assumed to be polytropic in nature where there will be loss of heat and mass by the meteoroid after entering into earth's atmosphere. Analysed on the vibrational density of states(VDOS) during NEO's descent some results have been found on the excitation of phonon frequency with respect to collision frequency, Further the VDOS of atoms at the front surface as well as the other faces will reveal the heating mechanism indicating that the phonons with the specific heat frequency are excited on which faces. The study provides an accurate model to understand the intrinsic mechanism of aerodynamic heating of NEO and it's variations due to change in collision frequency which will be helpful in establishing the relationship between the NEO and the surrounding environment at molecular level.