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Thermonuclear fusion by counter-propagating laser beams in magnetized overdense plasmas TAKAYOSHI SANO, SHINSUKE FUJIOKA, Osaka University, YOSHITAKA MORI, The Graduate School for the Creation of New Photonics Industries, YASUHIKO SENTOKU, Osaka University — Efficient energy transfer from electromagnetic waves to ions has been demanded to understand the nature of space plasmas and to control laboratory plasmas for various applications. However, there exists a serious unsolved problem that most of the wave energy is converted easily to electrons, but not to ions. We investigate an energy conversion process to ions in overdense plasmas associated with whistler waves. We find that ions in the standing whistler waves acquire a large amount of energy directly from the waves in a short timescale comparable to the wave oscillation period. Thermalized ion temperature increases in proportion to the square of the wave amplitude and becomes much higher than the electron temperature in a wide range of wave-plasma conditions. This efficient ion-heating mechanism is applicable to various plasma phenomena in space physics and fusion energy sciences. For the purpose of ICF, ions should be heated up to high temperature exceeding keV in imploded dense plasma. The standing whistler wave heating might give an advanced technique for an alternative ignition scheme of ICF by a completely different use of magnetic fields from the previous ideas. The keV ion plasma generated by this method could also be an efficient thermal neutron source.

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