The Formation of Crystalline Beams, J. WEI, Brookhaven National Laboratory, Upton, NY 11973, A. DRAESEKE, A.M. SESSLER, Lawrence Berkeley Laboratory, Berkeley, CA 94720, X-P LI, BIOSYN Technologies Inc., San Diego, CA 92121 - Using equations previously derived, and numerical simulations employing molecular dynamics, we have studied the requirements for crystalline beams and the necessary conditions to obtain them. We find that crystals can only be formed in AG storage rings operating below the transition energy and having 2Ã2 max (ν_x, $\nu_{y)}$ less than the frequency of the lattice periodicity. We determine the heating curve; that is, how fast crystals absorb heat from the lattice and therefore heat up and melt. The inverse of this process tells the rate of cooling which needs to be supplied to a beam so that a crystal is formed. We study how the MD goes over, at high temperature, into intra-beam scattering theory. Various methods of cooling are studied, such as pure longitudinal cooling (as in present laser cooling) which we find is not effective for forming 3D crystals, cooling in three dimensions, and cooling to constant angular velocity (rather than constant linear velocity).

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