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**Torsional Motion of Rotating Particles with Graded Couplings**
H.W. TSANG, J.J. XIAO, K.W. YU, The Chinese University of Hong Kong — Localization of excitations occurs in many physical systems. There are two common types of localization. The first type is a consequence of interference of coherent vibrational waves due to diffusive scattering like Anderson localization in lattice vibration. The other type of localization is due to confinement by impurities like defect modes. Graded systems occur in a variety of physical system. It is of great interest to analyze the localization of excitations in graded system [1]. In this work, we consider a system of rotating particles with graded torsional couplings. The steady-state solutions are solved directly from the dynamic equations. Energy is localized in the region of stronger couplings at high frequencies. A dynamic stimulation based on forced rotors is performed both for the graded linear and graded non-linear coupling potential subjected to a sinusoidal driving torque. In the small amplitude region, the results of non-linear potential are similar to those of the linear ones. The major difference is that the rotational amplitude is larger for the non-linear potential. Energy transfer may thus be more effective in the non-linear case. In the large amplitude region, chaos may occur and contribute to the localization.
[1] J. J. Xiao, K. Yakubo, and K. W. Yu, Harmonic vibrational excitations in graded elastic networks: transition from phonons to gradons, unpublished.

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