**Movie Captions:**

Movie S1. Deformation mechanism of pure Al sample under tension.

Movie S2. Deformation mechanism of BNNT-Al nanocomposite sample under tension.

Movie S3. Deformation mechanism of pure Al sample under tension in terms of atomic strain.

Movie S4. Deformation mechanism of BNNT-Al nanocomposite sample under tension in terms of atomic strain.

Movie S5. Deformation mechanism of pure Al sample under compression.

Movie S6. Deformation mechanism of BNNT-Al nanocomposite sample under compression.

Movie S7. Deformation mechanism of pure Al sample under compression in terms of atomic strain.

Movie S8. Deformation mechanism of BNNT-Al nanocomposite sample under compression in terms of atomic strain.