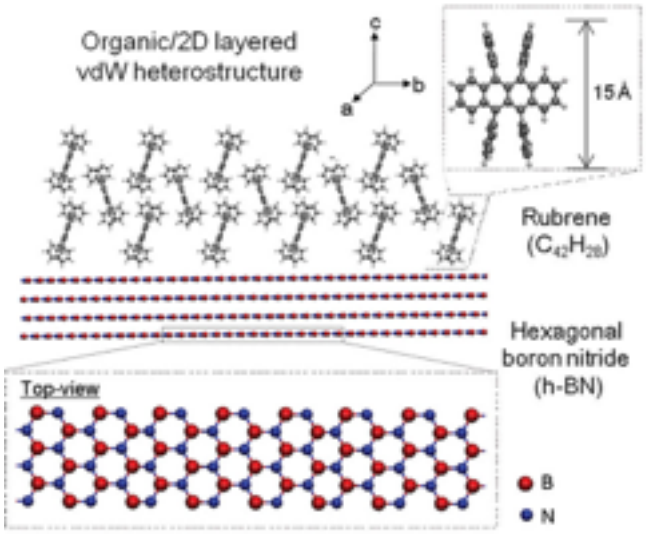
# Organic Crystal Film Grown on New Substrate Breaks Charge-Carrying Performance Record

## Scientific Achievement

**Grew high-quality crystal film of rubrene, an organic semiconductor, on new substrate material, hexagonal boron nitride (h-BN); film carries charge better than organic electronics materials on other substrates**

## Significance and Impact

**Success with h-BN substrates, a new player in organic electronics, provides platform for exciting new developments in the field**




Organic 2-D heterostructure of rubrene/h-BN

## Research Details

- Grew rubrene film on h-BN using "van der Waals epitaxy," which takes advantage of the weak van der Waals force between molecules
- Film thickness varied from 5 to 1000 nm; atomic force microscopy and transmission electron microscopy showed that rubrene film has local crystalline order epitaxial to h-BN substrate
- Grazing x-ray diffraction at NSLS beamline X9 indicated high-quality large crystalline domains
- Graphene electrical contacts incorporated during growth process yielded field-effect transistor geometry; current measurements show electrons highly mobile

C-H Lee, T Schiros, EJG Santos, B KIm, K Yager, SJ Kang, S Lee, J Yu, K Watanabe, T Taniguchi, J Hone, E Kaxiras, C Nuckolls, P Kim, *Advanced Materials*, Vol. 26, Issue 18, 2812-2817 (2014)

Work was performed at Brookhaven National Laboratory