# Surface-Assisted Reactions of *p*-Dihalobenzene-Based Precursors for Armchair-Type Graphene Nanoribbons

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Graphene nanoribbons (GNRs) have attracted significant interest as promising materials for fabricating nanoelectronic devices. For practical semiconductor applications, sufficiently long GNRs with moderate bandgaps are required. In this study, we investigated the effects of molecular structure and halogen substitution of *p*-dihalobenzene-based precursors on the on-surface synthesis of armchair-type GNRs (AGNRs). Specifically, BADIB for 17-AGNRs and BNDIB for 13-AGNRs were synthesized, and the corresponding GNR formation on an Au(111) surface was investigated by comparing the reactivity of the surface-assisted reaction with that of its brominated counterpart (Figure 1). The reaction of BNDIB on Au(111) evidently provided longer 13-AGNRs (maximum 55 nm) than those synthesized from the brominated counterpart BNDBB (maximum 30 nm), owing to a large separation in temperature requirements for polymerization and cyclodehydrogenation. Contrastingly, BADIB mostly produced small nanographene-like species and short 17-AGNRs (< 5 nm), whereas its brominated counterpart BADBB provided longer 17-AGNRs (maximum 30 nm).[1] Considering the precursor acene moiety (anthracene vs. naphthalene) and dehalogenation temperature (I vs. Br), the precursor mobility and acene moiety rotation on the Au(111) surface during polymerization might be hindered in the case of BADIB, owing to the BADIB–Au(111) surface van der Waals interactions, along with the low temperature during polymerization.

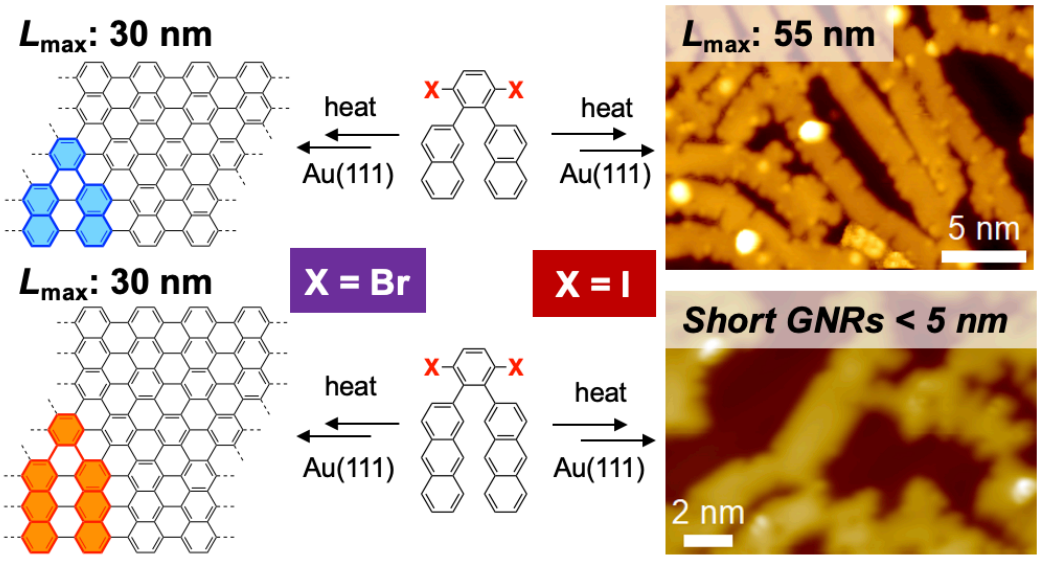


**Figure 1.** On-surface synthesis of GNRs by using *p*-dihalobenzene-based precursors.
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Reference

[1] J. Yamaguchi, H. Hayashi, et al. Commun. Maters. **1**, 36 (2020).