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## An Aza-Diels-Alder Approach To Polyquinolines

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### BRIEF DESCRIPTION

The invention is a simple and inexpensive synthetic approach to a diverse library of new polymeric materials with a host of useful and unique properties. Most notably, these materials can serve as precursors to rationally designed and bottom-up synthesized graphene nanoribbons (GNRs), including N-doped GNRs and GNRs with precisely defined and functionalized edges.

### FULL DESCRIPTION

Graphene nanoribbons (GNRs), which are narrow strips of graphene, constitute a promising class of materials for the next generation of semiconductor devices and nanoscale electronics. The electronic properties of GNRs are exquisitely sensitive to their width, heteroatom content, and edge character. Thus, much research effort has been devoted to the preparation of GNRs that are structurally and chemically defined at the atomic level. However, despite some successes of both traditional top-down lithographic approaches, and, more recently, bottom-up preparation of all-carbon GNRs via the surface-assisted or solution-phase synthesis, the incorporation of heteroatoms at arbitrary locations in graphitic materials remains unattainable, which is frustrating, given the immense potential of substitutional nitrogen doping for tailoring the properties of GNRs. The researchers at UCI have now developed a synthetic strategy for the preparation of soluble polybenzoquinolines, which have potential as GNR precursors. This approach furnishes polymers with a unique architecture and connectivity in only two synthetic steps from inexpensive, commercially available reagents. In addition, the present solution method is easily scalable, as it employs only straightforward reaction conditions. Moreover, the method is highly modular and allows for a great variety of previously unattainable polymeric backbones, graphitic architectures with enhanced solubility, and N-doped graphene materials. Finally, given the importance of quinoline derivatives for a variety of applications, the reported findings may hold implications across a diverse range of chemical and physical disciplines.

### SUGGESTED USES

Synthesis of novel materials, including well-defined nanomaterials, with unique chemical, optical, electrical, and mechanical properties, as well as synthesis of graphene nanoribbons and their precursors.

### ADVANTAGES

- Simple and inexpensive, synthesis that requires as few as 2 steps
- Amenable to scale-up, solution-phase chemistry
- Access to a greater variety of polymeric backbones, including previously unattainable molecular architectures and structural motifs, structures with enhanced solubility (without help from complex solubilizing side chains), and N-doped graphitic materials

### PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,899,711	01/26/2021	2015-409

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### OTHER INFORMATION

#### CATEGORIZED AS

- » **Materials & Chemicals**
  - » Chemicals
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  - » Nanomaterials
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