

Direct visualization of large-area graphene domains and boundaries by optical birefringency

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The boundaries between domains in single-layer graphene strongly influence its electronic, mechanical, magnetic and thermal properties. However, existing approaches for domain visualization, which are based on microscopy and spectroscopy, are only effective for domains that are less than a few micrometres in size. Here, we report a simple method for the visualization of arbitrarily large graphene domains by imaging the birefringence of a graphene surface covered with nematic liquid crystals. The method relies on a correspondence between the orientation of the liquid crystals and that of the underlying graphene, which we use to determine the boundaries of macroscopic domains. And we discovered the relationship between Cu domain and grown CVD domain structure by using this method. This technique should therefore open a new direction for studies directed at the elucidation of factors that control the domains, structures and properties of graphene, which is critical to realizing their potential applications.