Ultrafast mid-infrared (mid-IR) lasers are of great interest due to their potential in applications ranging from medical monitoring to materials processing and free-space optical communications. The most common technique to modelock these lasers relies on semiconductor saturable absorbers that require expensive growth techniques, often combined with ion implantation to reduce response time, and do not allow broadband operation. Novel nonlinear optical materials working in the mid-IR with better performance, cheaper fabrication, and easier integration are thus of interest.

Researchers at Cambridge University (Cambridge, England) and Imperial College London (London, England) have demonstrated that graphene is a promising broadband saturable absorber with ultrafast response time, easy fabrication and integration, and mechanical and environmental robustness. When used as a modelocker for ultrafast thulium-doped fiber lasers emitting at 1.94 µm, graphene can generate 3.6 ps laser pulses at a repetition rate of 6.4 MHz and approximately 0.4 nJ of energy with 6 ps timing jitter. Another collaboration between Cambridge University and the University of St. Andrews (Fife, Scotland) exploits single-layer graphene to modelock a high-power (270 mW) ultrafast (transform-limited 410 fs) solid-state laser at 2 µm. These results showcase the great potential of graphene for simple, low-cost, stable mid-IR ultrafast solid-state and fiber lasers. Contact Andrea C. Ferrari at acf26@cam.ac.uk.
Graphene delivers ultrashort mid-IR laser pulses - Laser Focus World

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