Bit of bling adds new dimension to laser beam technology

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Richard Mildren works with a CVD diamond.

(PhysOrg.com) -- No longer just an expensive ornament, diamonds are now of a sufficient size and quality to attract the eye of a team of physicists at Macquarie University, who are using them to develop a new more powerful laser.

And, says leader of the research, Richard Mildren, despite their size and

impressive appearance, the diamonds used in the laser experiments are surprisingly affordable.

"Using natural diamonds in this type of work is problematic - the quality is not consistent and, as everybody knows, they're very expensive," Mildren said.

"In the last two to three years the production method has really ramped up - diamonds can now be grown using a method called chemical vapour deposition (CVD) and a one centimetre-long crystal can be purchased for around $2000."

Diamonds can transmit heat and light very effectively, creating the potential for very powerful lasers and making them of extreme interest to scientists.

Their excellent optical properties have long been known, and there have been significant efforts around the globe to demonstrate diamond (diode) lasers for more than 15 years.

Mildren's team has now built the first diamond laser using a technique based on the Raman effect. Not only has this demonstrated a new more effective method for generating a powerful beam, it has also shown that CVD diamonds are of adequate size and quality to enable exploration of a new class of laser devices.

"This research could pave the way for new laser sources over a wide range of wavelengths and with very high power levels," Mildren said.

"The next step is to see how effectively CVD diamond lasers operate at even higher power levels. We'd also like to investigate the potential for diamond Raman lasers in the ultraviolet and long wave infrared regions where other materials can't operate."

If his future experiments are again successful, Mildren said there was potential for diamond Raman lasers to be used in everything from terahertz threat detection (eg. body scanning devices at airports) and ultra high precision laser surgery, to defence applications (eg. directed energy weapons).

Provided by Macquarie University