What a diamond a day makes

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SUPERHARD artificial diamonds have been produced in a day, almost from thin air. "To our knowledge, they are the hardest crystals of diamond ever reported," says Russell Hemley, supervisor of the team which produced the diamonds at the Carnegie Institution in Washington DC.

Tests showed that the new crystals were about 50 per cent harder than a selection of synthetic and natural diamonds. And at up to 5 millimetres thick, they are also the largest single gem crystals ever produced from a process called chemical vapour deposition. Whereas most existing diamonds made this way are films no thicker than a millimetre, the Carnegie team has successfully cut and polished its own 4.5-millimetre-thick films into rocks fit for jewellery, including the 2.5-millimetre-high gem below. "These are real gems, and the diamond is cut to our specifications," says Hemley.

The diamonds are made in two stages. First, the researchers gradually deposit a "rain" of carbon gas onto a pre-existing diamond surface to form a film of diamond. The rain is the fallout from plasma generated by bombarding a mixture of hydrogen and methane with charged particles. Then they cut the film into gemstones and expose the rocks to temperatures of up to 2000 °C and pressures 50,000 to 70,000 times atmospheric pressure.

This is what produced the exceptional hardness, say the researchers, who report their work in Physica Status Solidi (a) (vol 201, p R25). They say the superhard crystals could be useful in tools for cutting and abrading.

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