removal of THF yielded **4**, an analogue of the dysprosium compound. The N–N bond distances of 1.401(6) (**3**) and 1.405(3) Å (**4**) were determined by X-ray diffraction, and are comparable to those observed in the two dysprosium derivatives, and is consistent with a similar N_2 oxidation state.

The EPR spectrum of **3** exhibits multiline patterns indicative of coupling to two ^{14}N and ^{89}Y nuclei. This pattern becomes a triplet of triplets with introduction of ^{15}N, which is consistent with an $[N_2]^{3-}$ ligand (Fig. 1c). Open-shell density functional theory calculations on both yttrium compounds confirm the SOMO (singly occupied molecular orbital) as a principally N_2 π^* orbital indicating a bond order of 1.5 (ref. 1).

Now that a synthetic route to compounds with an $[N_2]^{3-}$ has been devised, what's next? Clearly a new opportunity is available for the discovery of nitrogen-element bond-forming reactions by radical pathways. It will be interesting to see if the nitrogen-centred radical has the thermodynamic potential and steric accessibility to activate weak C–H bonds or to add carbon-based radical reagents. A new structural type only proves its value through reactivity. The potential intermediacy of an $[N_2]^{3-}$ ligand in biological nitrogen fixation is also an enticing possibility.

Another question that arises from this work is whether the other odd-electron nitrogen oxidation states, $[N_2]^{-}$ and $[N_2]^{5-}$, are more common than we think. The latter species would have a formal bond order of 0.5 and may be an important intermediate in the stepwise cleavage of N_2. At the least the precedent of the $[N_2]^{3-}$ radical is a reason for hope. ❐

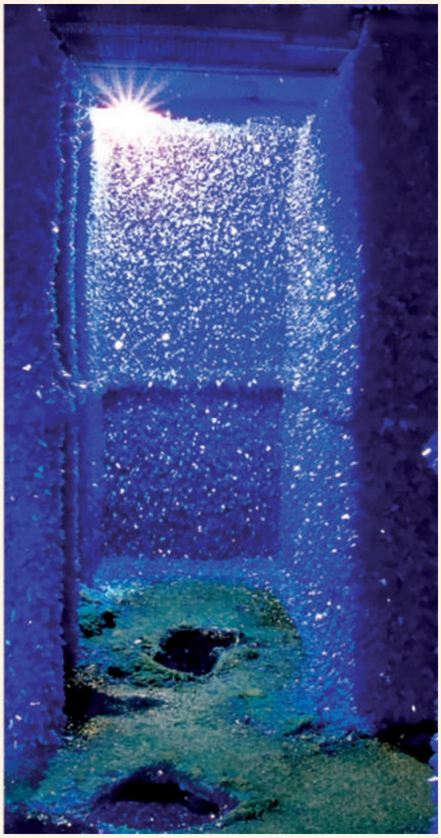
Paul J. Chirik is in the Department of Chemistry and Chemical Biology, Baker Laboratory, Cornell University, Ithaca, New York 14853, USA. e-mail: pc92@cornell.edu

References

1. Evans, W. J. *et al. J. Am. Chem. Soc.* **131,** 11195–11202 (2009).
2. MacLachlan, E. A. & Fryzuk, M. D. *Organometallics* **25,** 1530–1543 (2006).
3. Morello, L., Love, J. B., Patrick, B. O. & Fryzuk, M. D. *J. Am. Chem. Soc.* **126,** 9480–9481 (2004).
4. Knobloch, D. J., Toomey, H. E. & Chirik, P. J. *J. Am. Chem. Soc.* **130,** 4248–4249 (2008).
5. Evans, W. J., Hughes, L. A. & Hanusa, T. P. *J. Am. Chem. Soc.* **106,** 4270–4272 (1984).
6. Pfirrmann, S., Limberg, C., Herwig, C., Stößer, R. & Ziemer, B. *Angew. Chem. Int. Ed.* **48,** 3357–3361 (2009).

EXHIBITION

The blue art of crystallization



SEIZURE ROGER HIORNS/ARTANGEL, 2008. PHOTOS: MARCUS LEITH

Crystallization is a common method in synthetic chemistry that allows the isolation and purification of compounds, and also aids their characterization through techniques such as X-ray crystallography. What is less expected is to find it being used as a method for creating art. This is why Roger Hiorns's *Seizure* exhibit has attracted thousands of fascinated visitors each week. Open to the public between July and October this year, *Seizure* is a disused flat in a low-rise block in South London — the interior of which has been entirely claimed by a dense growth of blue crystals. The artist has allowed crystalline copper sulfate to grow on the walls, the ceilings and on the remaining objects — the bath and a few pendulous light fittings — in this small two room flat.

Both chemists and non-chemists alike will remember being amazed when crystallizing samples of copper sulfate using their childhood chemistry set or in their first school experiments, but this exhibit astonishes through its sheer scale. The flat was reinforced with steel and transformed into a watertight tank before over 70,000 litres of saturated copper sulfate solution was pumped in at 60 °C. Crystallization occurred as the solution cooled to 30 °C over the course of several weeks, and the result was only revealed when the flat was drained and an entrance to visitors cut.

Hiorns's choice to use copper sulfate as a medium stems from his interest in using materials that create the sculpture themselves, in the absence of the artist. Previous work by the sculptor has involved crystallization on the surfaces of small objects in his studio, however it is this large-scale project that has earned Hiorns a nomination for the 2009 Turner Prize — a prestigious award that celebrates new developments in contemporary art — the winner of which will be announced in December.

LAURA CROFT