

## Making an imPACT

### On the Claims for the Discovery of Elements 110, 111, 112, 114, 116, and 118 (IUPAC Technical Report)

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### Name and Symbol of Element of Atomic Number 110 (IUPAC Recommendations 2003)

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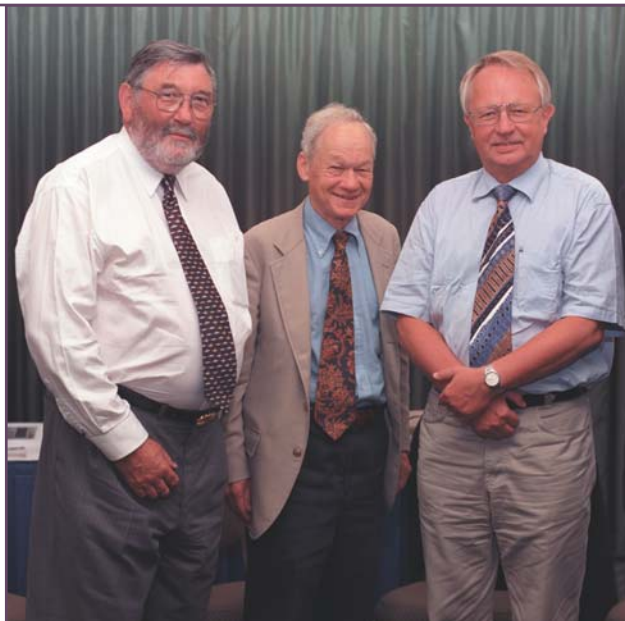
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The IUPAC/IUPAP Joint Working Party (JWP) reports on the claims—based on articles submitted by December 2001 from the various claimants—for the discovery of elements 110, 111, 112, 114, 116, and 118. For each element, a detailed discovery profile precedes the JWP assessment.

The JWP, comprised of four independent experts, works with the criteria as previously established and used in 1992 and 1999 during the examination of the transfermium elements. While following strict criteria, the intention of the JWP is not to set a higher standard for “discovery” than that applied elsewhere in science, but rather to conform to a uniform, consistent basis for definitive observation and interpretation. During their deliberations, the JWP balances a sensibly conservative stance with the need for reasonable flexibility.

For element 110, the priority of discovery is unchanged and the JWP re-endorses the confirmed synthesis of element with atomic number 110 by the team at Gesellschaft für Schwerionenforschung (GSI) led by S. Hofmann; re-assessment was necessitated by revelations at the Berkeley and GSI laboratories of some apparently fabricated or partially modified decay chains. Concurrently, and in accordance with IUPAC procedures, the discoverers were invited to propose a name and symbol for the new element. The discoverers proposed the name **darmstadtium**, and the symbol **Ds**, which were both then recommended by the Inorganic Chemistry Division and approved by the IUPAC Council at its most recent session on 16 August 2003 in Ottawa (see IUPAC recommendations published in *Pure and Applied Chemistry*, Vol. 75, No. 10, pp. 1613–1615, 2003).

For element 111, the JWP revisited the 1995 report by Hofmann *et al.*, and also reviewed their most recent 2002 publication. The JWP has decided to assign priority of discovery of that element by that collaboration. In its 2001 report, the JWP concluded that the results of



**Naming element 110—(from left) John Corish and Gerd Rosenblatt (IUPAC Inorganic Chemistry Division) and Sigurd Hofmann (GSI, in Darmstadt) at the IUPAC Council in Ottawa, 16 August 2003.**

Q&A by S. Hofmann about Ds are available online at  
<[www.iupac.org/news/archives/2003/aboutDs.html](http://www.iupac.org/news/archives/2003/aboutDs.html)>.

the collaboration of Hofmann *et al.* were definitely of high quality, but there was insufficient internal redundancy to warrant certitude at that stage. The additional observations presented in their 2002 publication were considered convincing, despite the lack of independent confirmation of the isotopes observed. The decision to assign priority of discovery is justified not only on the basis of the quality of the work and reproducibility, but also on the fact that previously characterized nuclides were identified as part of the detection sequence(s). Again, following the procedure for naming new elements, the discoverers at GSI have been asked to propose a name and symbol for the new element. A provisional recommendation is expected soon.

For elements 112, 114, and 116, the collaborations of Hofmann *et al.* and of Oganessian *et al.* produced high-quality data with plausible interpretations. However, confirmation by further results is needed to assign priority of discovery for these elements. The JWP was not persuaded that other collaborations have satisfied the discovery criteria.

For element 118, observation of the element has been retracted by the original investigators. No assessment by the JWP was performed.



[www.iupac.org/publications/pac/2003/7510/7510x1601.html](http://www.iupac.org/publications/pac/2003/7510/7510x1601.html)  
[www.iupac.org/publications/pac/2003/7510/7510x1613.html](http://www.iupac.org/publications/pac/2003/7510/7510x1613.html)