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Erratum

Erratum to "From simple building blocks to structures with increasing size and complexity" [Coordination Chemistry Reviews 182 (1999) 3–17][☆,☆☆]

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The publisher regrets that the following errors occurred when this article was originally printed.

On page 3, number 3 in the contents list should read:

"3. From the micro- to the meso"cosmos".....7"

On page 3, the footnote to the article title, the text in parenthesis should read:

"(Le Centre Scientifique de l'Académie Polonaise des Sciences à Paris)"

☆ PII of original article S0010-8545(98)00226-4.

☆☆ Corrected reprints of full article available, upon request from author.

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[1] This manuscript is principally based on a lecture presented by A.M. at the meeting 'From Large Molecules to Nanostructures' (Le Centre Scientifique de l'Académie Polonaise des Sciences à Paris). Paris, 30–31 October, 1997. As the lecture is based mainly on our own research work, citations of our work dominate.

PII: S0010-8545(99)00133-2

On page 3, the corresponding author's e-mail address should read:

''e-mail: a.mueller@uni-bielefeld.de''

On page 4 the legend to Fig. 1 should read as follows:

Fig. 1. Based on the functionalization of $\{AsMo_9O_{33}\}$ fragments (polyhedral representation) with three highly reactive facial $\{MoO_3\}$ groups in $[(AsOH)_3(MoO_3)_3(AsMo_9O_{33})]^{7-}$ (left) condensation reactions to $[(AsOH)_6(MoO_3)_2(O_2MoOMoO_2)_2(AsMo_9O_{33})_2]^{10-}$ (middle) and $[(AsOH)_4(AsO)_2(HOAsOMoO_2)_2(O_2MoOMoO_2)_2(AsMo_9O_{33})_2]^{8-}$ (right) are possible.

On page 5 the last sentence in the first paragraph should read as follows:

An example for such a procedure is provided by the coordinatively unsaturated lacunary Keggin structures $[SiW_{11}O_{39}]^{8-}$ (N) with electrophilic $[Mo_3S_4(H_2O)_9]^{4+}$ units (E) and $[(SiW_{11}O_{39})_2\{Mo_3S_4(H_2O)_3\}_2(\mu\text{-}OH)_2]^{10-}$ whereby water molecules function as leaving groups (see Fig. 2) [3].

On page 6 the second last sentence of the first paragraph should read:

The general principles of relevant one-pot reaction conditions are of interest for problems of prebiotic chemistry, chemical evolution, and conservative self-organization but are, in principle, of industrial interest in the sense of Ugi's multicomponent reaction (MCR)-type studies, too [4].

On page 6, the last sentence in the quote from Stuart A. should read:

Kauffman has argued that this process of 'autocatalysis'—rather than the fortuitous formation of a molecule with the ability to replicate and evolve—led to life.''

On page 7, the first paragraph should read:

3. From the micro- to the meso"cosmos"

Subsequent to our publication [11] of a wheel-shaped metal–oxide based cluster anion containing 154 molybdenum atoms ($[Mo_{154}(NO)_{14}O_{434}(OH)_{14}(H_2O)_{70}]^{28-}$, $\{Mo_{154}\}$) of 4.1 nm diameter and built up from the aforementioned $\{Mo_8\}$ groups which are linked by $\{Mo_2\}$- and $\{Mo_1\}$-type units (Fig. 4), David Bradley metaphorically stated in New Scientist [12]

On page 7, the legend to Fig. 3 should read:

Fig. 3. Polyhedral representation of the cluster $\{Mo_{57}\}$ with its basic building blocks along the C_3 (upper left) and one of the three C_2 axes (upper right): On the upper right, one $\{Mo_{17}\}$ group, consisting of one $\{Mo_1\}$ and two $\{Mo_8\}$ groups and on the upper left, three $\{Mo_8\}$ units. For comparison polyhedral representations of $\{Mo_{36}\}$ cluster structure, consisting of two $\{Mo_{17}\}$ groups linked by two different $\{Mo_1\}'$ units, are shown in the related views, also highlighting one $\{Mo_8\}$ unit (bottom left) and one $\{Mo_{17}\}$ unit (bottom right).

On page 10, the second last sentence in the first paragraph should read:

Also remarkable is that all known resulting cluster shells can be regarded as sections of layers of vanadium pentoxide (V_2O_5) ([16]a, [20]).

On page 12, the heading for section 6, should read:

6. Molecular growth to complexity by symmetry breaks with feedback (induced cascade)

On page 12, the second last sentence, in the second paragraph in section 6 should read:

In the latter case each intermediate carries information, in the sense of Monod, for the induced formation of the subsequent intermediate **2*n*** which was not originally abundant in solution (induced cascade-type reaction) thus demonstrating an interesting feedback effect.

On page 13, the last two full sentences on this page should read:

In solutions containing this cluster the (more strongly reduced) wheel-shaped cluster $\{Mo_{154}\}$ ($[Mo_{154}(NO)_{14}O_{434}(OH)_{14}(H_2O)_{70}]^{28-}$) forms upon further acidification and reduction [11]. The $\{Mo_{154}\}$ cluster (which turned out to comprise the prototype of the molybdenum-blue species [26]) can be regarded as a tetradecamer that meets D_{7d} symmetry if the hydrogen atoms are excluded.

On page 14, points 3–7 should read:

3. The huge surface area contributes to the high affinity towards absorbents, such as charcoal or silk.

4. It renders a molecular model for catalytically active metal–oxides.

5. The aqueous solution shows further aggregation tendencies: the formation of colloids of 40 nm hydrodynamic radius could be detected by means of dynamic light scattering.

6. The periphery of the cluster ring shows a rather high electron density.

7. It is possible to generate deliberately discrete structural defects on the inner area.

On page 14, the last two paragraphs should read:

From the same above-mentioned building blocks an even larger cluster with 176 molybdenum atoms ($\{Mo_{176}\}$), i.e. a hexadecameric ring structure, can be derived, containing correspondingly 16 instead of 14 of each of the three mentioned building blocks (Fig. 10) [27]. Even more interesting: under stronger reducing conditions polyoxometalate fragments of the type $\{Mo_{36}\}$ grow inside the cluster cavity, resulting in a cluster system with 248 molybdenum atoms ($\{Mo_{248}\}$ cluster) [28]. This is in terms of the number of metal atoms the largest known cluster that has been structurally characterized so far. The mentioned ring clusters are formed in the reaction medium in a time scale of a few seconds (observable via resonance Raman spectroscopy), but the exact formation mechanism is unknown until now.

Furthermore, the ring-shaped clusters linked to chains can also act as hosts for smaller polyoxometalate clusters, such as for the $\{Mo_{36}\}$-type cluster. In this supramolecular system the interaction between host and guest, which fits exactly into the cavity of the host, is due to 16 hydrogen bonds as well as the Coulomb

attraction mediated by four Na^+ cations located in between the negative host and guest (Fig. 11).

On page 15, the heading for section 8, should read:

8. Outlook

On page 15, in section 8, the first three sentences should read:

Is the size of such clusters limited or can we fabricate even larger assemblages? Dynamic light scattering experiments on solutions of the $\{Mo_{154}\}$-type clusters show the presence of extremely large colloids with a hydrodynamic radius of ca. 40 nm, the structure of which is as yet unknown [31]. Referring to biological systems we are therefore dealing with a cluster size comparable to that of the mentioned tobacco mosaic virus. Since the discussed polyoxometalate chemistry covers several orders of magnitude with respect to the number of atoms and the size of the clusters, its nomination as a 'Powers of Ten'-type chemistry in accordance with the famous book title seems justified.

On page 16, the legend to Fig. 11 should read:

Fig. 11. Some structural details of the novel supramolecular system $\{Mo_{36} \subset Mo_{148}\}$ ($\{Mo_{36}\}$ occupation: 20%). Only a part of the chain structure is shown, which is built up by linking the ring-shaped clusters $\{Mo_{148}\}$ with three missing $\{Mo_2\}$ groups compared to the $\{Mo_{154}\}$-type cluster. The interaction between host (in polyhedral representation) and guest (ball and stick) is due to 16 hydrogen bonds (dotted) and four sodium cations situated between host and guest.

On page 16, reference [3] should read:

[3] A. Müller, V.P. Fedin, C. Kuhlmann, H.D. Fenske, G. Baum, H. Bögge, B. Hauptfleisch, Chem. Comm. (1999) 1189.

On page 17, reference [5] should read:

J. Horgan, Sci. Am., June Edition (1995) 74.

On page 17, reference [8] should read:

[8] (a) A. Müller, C. Beugholt, Nature 383 (1996) 296. (b) A. Müller, E. Krickemeyer, S. Dillinger, H. Bögge, W. Plass, A. Proust, L. Dloczik, C. Menke, J. Meyer, R. Rohlfing, Z. Anorg. Allg. Chem. 620 (1994) 599.

On page 17, reference [13] should read:

[13] (a) A. Müller, J. Mol. Struct. 325 (1994) 13. (b) A. Müller, M.T. Pope, Increasing the size of polyoxometalates: emergent properties upon self-assembly and condensation processes, in: K. Mainzer, A. Müller, W.G. Saltzer (Eds.), From Simplicity to Complexity, Part II, Information–Interaction–Emergence, Vieweg, Wiesbaden, 1998, p. 57.

On page 17, reference [18] should read:

[18] (a) W.E. Billups, M.A. Ciufolini (Eds.), Buckminsterfullerenes, VCH, Weinheim, 1993. (b) W. Krätschmer, H. Schuster (Eds.), Von Fuller bis zu Fullerenen, Beispiele einer interdisziplinären Forschung, Vieweg, Braunschweig, 1996.

On page 17, reference [28] should read:

[28] (a) A. Müller, S.Q.N. Shah, H. Bögge, M. Schmidtmann, Nature 397 (1999) 48. (b) P. Ball, Nature 395 (1998) 745.

On page 17, reference [31] should read:

[31] A. Müller, W. Eimer, E. Diemann, C. Serain, unpublished results.

On page 17, reference [32] should read:

[32] (a) A. Müller, A. Dress, F. Vögtle (Eds.), From Simplicity to Complexity in Chemistry—and Beyond, Part I, Vieweg, Wiesbaden, 1996. (b) K. Mainzer, A. Müller, W.G. Saltzer (Eds.), From Simplicity to Complexity, Part II, Information–Interaction–Emergence, Vieweg, Wiesbaden, 1998. (c) K. Mainzer, Thinking in Complexity, 3rd edn., Springer, Berlin, 1997.