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Comments on "Experimental Multivalent Ionic Radii"

CHUA¹ has listed the ionic radii for a number of divalent lanthanide species, La²⁺, Ce²⁺, Nd²⁺, Sm²⁺, Eu²⁺, Yb²⁺, some of which are probably incorrect. For convenience the radii given by Chua are listed in Table 1. Inspection of these values shows immediately that the value for Eu²⁺ is anomalously high compared with those lanthanides with lower atomic numbers, La²⁺ to Sm²⁺. At first one might be inclined to believe the value for Eu²⁺ is incorrect. But further examination reveals that these radii were calculated from the lattice parameters reported for the respective RO(NaCl-type) compounds listed by me² (Chua's reference 14). Of these six RO compounds the only definitely known cation valence state is that of Eu which has been shown by magnetic measurements to be divalent³. Very little is known about the other RO compounds, and their existence has been seriously questioned⁴. If they should exist there is no reason why La, Ce and Nd would be expected to be divalent in these compounds (Sm and Yb, however, could be divalent). Indeed, if one examines the corresponding RSc, RS and RTe, one finds that La, Ce and Nd in these NaCl-type compounds are trivalent. Because the valence state of these five lanthanide ions in the RO compounds has not been established, the divalent radii given for La²⁺, Ce²⁺, Nd²⁺, Sm²⁺ and Yb²⁺ are open to question.

Table 1. IONIC RADII FOR THE R²⁺ IONS¹

Ion	Radius (Å)	Ion	Radius (Å)
La ²⁺	1.53	Sm ²⁺	1.41
Ce ²⁺	1.47	Eu ²⁺	1.48
Nd ²⁺	1.44	Yb ²⁺	1.34

A plot of the radii of these "divalent" ions as a function of atomic number along with that for Ba²⁺, Fig. 1, shows that only the radius for Yb²⁺ lies on the line established by the two ions (Ba²⁺ and Eu²⁺) which are known to be divalent. Furthermore, the values for La²⁺, Ce²⁺, Nd²⁺ and Sm²⁺ clearly lie below this line, and thus it is concluded that the divalent radii given by Chua for these four lanthanides are unreliable and should be discarded.

Fig. 1. "Divalent" ionic radii of the barides (Ba, Eu and Yb) and lanthanides (La, Ce, Nd and Sm) as a function of atomic number.

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K. A. GSCHNEIDNER, JUN.
 Institute for Atomic Research and
 Department of Metallurgy,
 Iowa State University.

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BIOLOGICAL SCIENCES

Initiation of SV40 DNA-directed Protein Synthesis with N-Formylmethionine *in vitro*

We are studying several aspects of the flow of genetic information from DNA to protein with an *in vitro* system in which RNA synthesis is coupled to protein synthesis. The coupled system, which is prepared from *Escherichia coli*, is primed with the replicating form of DNA from the bacteriophage ϕ X174. During total asymmetric transcription of the template, several cistrons are translated (refs. 1, 2 and unpublished results of R. N. B. and M. H.). The principal product, which is initiated with N-formylmethionine, is a ϕ X174 structural protein with a molecular weight of about 20,000. We now demonstrate that DNA from the animal virus SV40 can prime this bacterial system. Two proteins are synthesized, and their estimated molecular weights are about 7,000 and 16,000. The molecular weight of the larger is close to the molecular weight of the SV40 coat protein, 16,350 (ref. 5). Both proteins are initiated with formylmethionine.

Fig. 1 shows the kinetics of RNA and protein synthesis in the coupled system using SV40 DNA as template. They are essentially identical to the kinetics achieved with ϕ X174 RF DNA. SV40 DNA was a reasonable choice for testing the priming ability of an animal viral DNA because its molecular weight and intracellular forms are similar to those of ϕ X174 DNA^{3,4}.

Protein was isolated from the coupled system after 60 min incubation by several treatments with phenol.

Fig. 1. Kinetics of RNA and protein synthesis in the coupled system. A standard reaction mixture (SRM, 0.13 ml) contained, per ml., 12 μ moles *tris* (pH 7.9); 11.5 μ moles magnesium acetate; 69 μ moles ammonium chloride; 7 μ moles 2-mercaptoethanol; 5 μ moles phosphoenolpyruvate; 2 μ moles ATP; 0.4 μ moles each of GTP, CTP and ³H-UTP; 0.03 μ moles each of nineteen ¹⁴C-amino-acids; 0.025 μ moles ¹⁴C-valine; 38 μ g pyruvate kinase; 28 μ g SV40 DNA; 45 μ g DNA-dependent RNA polymerase; 38 A 260 nm units *E. coli* Q13 ribosomes; and 5.2 A 260 nm units *E. coli* Q13 soluble fraction. After incubation at 33°C RNA synthesis was measured as the incorporation of ³H-UMP into cold trichloroacetic acid precipitable material, and protein synthesis was measured as the incorporation of ¹⁴C-valine into hot perchloric acid insoluble material.