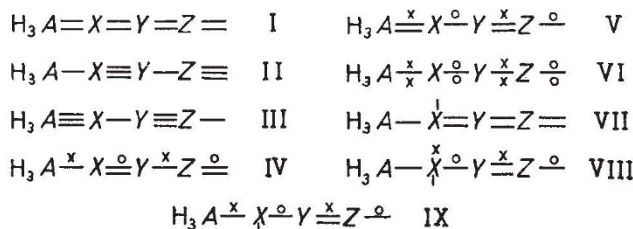


be bent. In addition to VIII, because the valence-shell of silicon can be expanded beyond eight electrons, silyl azide can have the structure IX in which the formal charges on A, X, Y and Z are  $-\frac{1}{2}$ , 0, +1 and  $-\frac{1}{2}$ . In IX there are a greater number of electrons in bonds than in VIII so the former is probably preferred. However, both correspond to non-linear structures so silyl azide will be expected to be bent. Structures I to VI have been shown to be unsatisfactory, and VII is unsatisfactory for the same reason as for methyl azide.



The essential reason why silyl isocyanate and isothiocyanate are linear is that the multiple (or  $\pi$ ) bonding in the SiN bond and the resulting electron distribution can be accommodated when the end atom is oxygen (or sulphur). They cannot be accommodated in silyl azide in which the end atom is nitrogen, because of its lower nuclear charge. Consequently the nature of the atom at one end of the chain affects the double (or  $\pi$ ) bonding at the other.

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### Constant Energy Differences in Atomic Structure

In a recent article Dash<sup>1</sup> has emphasized how three successive ionization potentials  $I_p$ ,  $I_{p+1}$ ,  $I_{p+2}$  in an isoelectronic series of atoms give a constant second difference which is equal to twice the Rydberg constant  $R$  divided by the square of the principal quantum number  $n$  of the electron being ionized, thus:

$$I_p - 2I_{p+1} + I_{p+2} = 2R/n^2 \quad (1)$$

This relationship is a mathematical consequence of Glocker's<sup>2</sup> empirical quadratic:

$$I = \frac{R}{n^2} [\alpha Z^2 + \beta Z + \gamma] \quad (Z \text{ is the atomic number}) \quad (2)$$

if  $\alpha$ ,  $\beta$ ,  $\gamma$  are constant in an isoelectronic series, and if  $\alpha = 1$  as shown empirically by Lisitzin<sup>3</sup> some years ago.

Dash's article provides, therefore, further empirical support for this quadratic. The evidence for it has recently been reviewed by me, and a derivation given from elementary quantum-theory using screening constants which have other applications<sup>4</sup>. A wave-mechanical derivation has since been given by Crossley and Coulson<sup>5</sup>. Both derivations explain simply why  $\alpha$  is unity.

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### Influence of Crystal Defects on the Annealing of Chemical Radiation Damage

RECENT investigations have shown that crystal defects determine the fate of the fragments generated in solids by radiative thermal neutron capture as well as the kinetics of subsequent annealing reactions<sup>1,2</sup>. So far, there has been no experimental evidence for the influence of defects on the annealing of chemical damage produced in solids by irradiation. We have now obtained such evidence in the case of annealing in lead nitrate.

Previous workers had introduced defects by crushing, exposure to ionizing radiations, or by incorporating in the crystal small concentrations of ions bearing a different charge to the corresponding ions in the host lattice. It is known<sup>3,4</sup> that vacancies, and possibly interstitials, are generated in ionic solids also by compression. We compressed under 40 tons/in.<sup>2</sup> crystals (30-100 mesh) of lead nitrate which had been previously dried and irradiated *in vacuo* in sealed 'Pyrex' ampoules with about 50 Mrads of cobalt-60  $\gamma$ -rays. The compressed and the uncompressed samples were heated for different time intervals at 150°C. The experimental procedure for estimation of the damage was as reported earlier<sup>5,6</sup>.

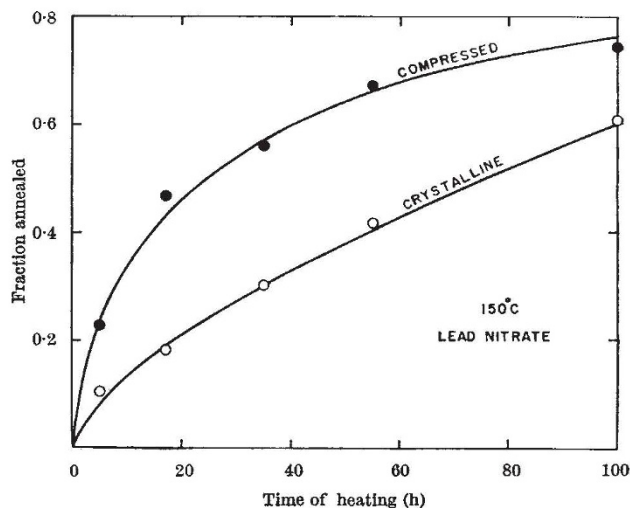


Fig. 1. Influence of compression on the annealing in lead nitrate

In Fig. 1 is shown the fraction of damage annealed against the time of heating in hours. The greater annealing of the compressed material as compared with that of the uncompressed crystals is evident. Thus, the fraction annealed over 35 h was 0.300 for the uncompressed, and 0.559 for the compressed, salt.

We thank Mr. Mata Saran for his help with the compression experiments. We also thank the Atomic Energy Establishment, Trombay, for the irradiations which were performed with the gamma-ray and sterilization unit presented by the Government of the United States. One of us (S. R. U.) gratefully acknowledges award of a scholarship by the Ministry of Scientific Research and Cultural Affairs, Government of India.

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