

**Synthesis of Elements and Solid Structures  
in Atomic–Nuclear Reactions in Dense Gases  
and Dense Gas–Metal Systems as a Result  
of Gamma Quanta Irradiation**  
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T. WILCZYŃSKA<sup>a,\*</sup>, G. MISHINSKY<sup>b</sup> AND R. WIŚNIEWSKI<sup>a,c,d</sup>

<sup>a</sup>National Centre for Nuclear Research, Otwock-Świerk, Poland

<sup>b</sup>Joint Institute for Nuclear Research, Dubna, Russia

<sup>c</sup>Warsaw University of Technology, Physics Faculty, Warsaw, Poland

<sup>d</sup>Institute of Agricultural and Food Biotechnology, Warsaw, Poland

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\*e-mail: [teresa.wilczynska@gmail.com](mailto:teresa.wilczynska@gmail.com)

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From The Editors:

The article [1] was originally published in the Special Issue of *Acta Physica Polonica A* devoted to the XLVI Extraordinary Congress of Polish Physicists. The sealing problem in the pressure device used in investigations deserves special attention of field researchers, according to the Authors.

The Authors' addendum follows below.

The practice of high-pressure fluid seals has a long history. The last solution to the problem involves the Bridgman type II sealing and the so-called O-rings, i.e., ring seals with a circular cross-section. These O-rings are made of elastic and highly deformable materials (mainly the properly selected rubbers, elastomers and — in the case of our investigations — the material commercially named “viton”), operating on the principle of an uncompensated (unsupported) surface, see Fig. 2 in [1]. The use of such seals during the compression of hydrogen (deuterium) has resulted in high gas solubility in O-ring materials making them inoperable. An example would be the following data: under pressure of 3.2 kbar, after some days, the gasket failed. After removing it from the pressure chamber, it turned out to be strongly swollen and cracked in the frontal part at a length of 1/4 of the circumference, and only after a few days, in the atmospheric air conditions, it regained its original dimensions. The amount of hydrogen desorbed was not studied, the role of hydrogen, however, seemed obvious here. Predominantly this fact necessitated the replacement of the sealing system in Fig. 2 with a two-cone system shown in Fig. 9<sup>†1</sup> [1].

An example of notation on the seal dimensions observed, obtained for the output state H<sub>2</sub>, under  $p = 3200$  bar, namely:

- September 25, 2013:
  - outside diameter — 20 mm,
  - circular cross-section diameter — 2 mm,
- (morning) September 30, 2013, dismounting:
  - external diameter — 25 mm,
  - circular cross-section diameter — 2.5 mm,
- (evening) September 30, 2013:
  - external diameter — 23.5 mm,
  - circular cross-section diameter — 2.25 mm,
- October 1, 2013:
  - external diameter — 20.5 mm,
  - circular cross-section diameter — 2 mm,
- October 2, 2013: initial dimensions.

The data are derived from archived laboratory notebooks of the Pressure Research Laboratory, NCBJ (NCNR).

### References

- [1] T. Wilczyńska, G. Mishinsky, R. Wiśniewski, *Acta Phys. Pol. A* **139**, 438 (2021).

<sup>†1</sup>The second reason was to eliminate substances of imprecise composition, on the tracks of gamma quanta in the irradiated volume, except the programmed Cu and Be atoms in the elements of the high-pressure apparatus.