

Comments by Michael Paul [to Retraction Watch](#)

The published half-life value was based on three measurements:

1- ratio of alpha activity (which is the rate of alpha particle emissions) in targets containing both ^{146}Sm and ^{147}Sm . ^{147}Sm is a naturally occurring alpha-emitting isotope of samarium with a very long half-life (106 Gy) which is well known. ^{146}Sm is an artificial alpha-emitting isotope of samarium whose half-life has been in debate for many years because of the difficulty in its determination.

2- ratio of number of ^{146}Sm atoms to ^{147}Sm atoms. The measurement was performed by an advanced technique of accelerator mass spectrometry (AMS) on samples of larger mass than those used for alpha activity (see above); the latter samples were very small and needed therefore to be "diluted" with natural samarium for the atom ratio determination.

3- dilution ratio between the samples measured for alpha activity and those measured for atom ratio. The dilution ratio was determined based on the (very small) amount of ^{147}Sm in the alpha-emitting samples which was measured by a different mass spectrometry technique, inductively-coupled mass spectrometry (ICPMS).

The inconsistency consists in the value of the dilution ratio determined as above (3) published in the 2012 paper and one that can be derived based on alpha activity of ^{147}Sm alone.

Steps 1 and 3 above were performed in a different lab from step 2 by mostly different co-authors of the work. There is no reason to state which group or lab within our collaboration did which part of the experiment. Our joint conclusion is that out of the three measurements listed above, the determination (3) of the dilution ratio by ICPMS is flawed. The origin of this flaw in a method as widely used as ICPMS is unknown to us. The AMS atom-ratio measurements are not related with the inconsistency above.

The inconsistency was pointed out to us only recently by an independent group, who requested not to be identified. Their finding relied on an analysis the information contained in the original publication and the detailed supplementary material adjoined to it. It is utterly surprising that it had eluded up to this "late point" all co-authors, reviewers and readers of the original article who could have reached the same conclusion based on published material.

The ^{146}Sm half-life is valuable for chronology of the early Solar system formation, including planet Earth's early geophysical history. Several groups involved in this field who use the ^{146}Sm - ^{142}Nd chronometer for geophysical dating compared conclusions reached with the shorter ^{146}Sm half-life value published in 2012 and with the previously used longer value. They pointed out that the shorter half-life results in geophysical inconsistencies and eventually have kept relying on the longer half-life value. An independent comparative study of the ^{146}Sm half-life measurements (Villa et al., *Geochimica et Cosmochimica Acta*, 285,70 (2020)) concluded that a "no consensus value can be endorsed at present" on the ^{146}Sm half-life value.

The retraction was made to inform the relevant community on the fact that the half-life value published in 2012 is in doubt. A reliable correction of that value seems unfortunately not possible and demands a new measurement which we are considering.