

A Method of Atomic Transformation, I

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Abstract: *Previously, we introduced a new model of the atom that predicted that atomic transformation (transmutation) could be carried out under low energy conditions akin to chemical catalysis. In this paper, we provide proof of this model, using liquid and solid state catalysis in a two-step process. We have found that the high ionic/electric activity of a concentrated sodium hydroxide solution in combination with heating is sufficient to induce atomic transformation and provide a product high in sodium, aluminum and silicon. When heated at a temperature of 1,000°C, this product yields numerous elements of higher atomic masses. Thus, atomic transformation was demonstrated using common chemicals and simple laboratory procedures. Our results suggest that current theories of the atom and atomic processes should be revised to account for low energy atomic transformation.*

Introduction

At this time, elemental transformation (transmutation) is carried out in nuclear reactors or using other sources of nuclear radiation. These methods are unsuitable for low cost, mass production of elements and generate many radioisotopes. Over the past two decades, numerous research reports have emerged on low energy nuclear reactions, e.g., the formation of tritium from deuterium on Pd,¹ the formation of Fe in gold electrodes, or the formation of helium and cadmium in a Pd electrode,² as well as the formation of other elements.³ These data were largely viewed with skepticism, as low energy nuclear reactions are not explainable within our current understanding of atomic processes.

We recently introduced a new theory of the atom that provides a theoretical framework for the design of low energy nuclear reactions.^{4,5} The theory proposes that atoms are complex electromagnetic waveforms that are circulators of the space lattice, the carrier medium for electromagnetic interactions. We suggested that only electromagnetic energy exists, and therefore electromagnetic pressure waves of sufficient intensity should induce atomic transformation. In addition, the atom should be viewed as a whole, irrespective of whether chemical or nuclear reactions are concerned. For this reason, we introduce here the term low energy atomic transformation to replace the currently used term “nuclear reaction” to describe the synthesis of elements under conditions akin to chemical catalysis.

We hypothesized that sufficient electric pressure could be generated by utilizing high ionic activities of molecules, a method commonly used in chemical catalysis. We reasoned that a single catalytic step may be enough to produce elements of lower atomic masses, and such procedure is demonstrated in this paper. The synthesis of elements of higher atomic masses requires an additional catalytic step.

Materials and Methods

All chemicals were obtained from Sigma-Aldrich and were of ACS grade or equivalent. All containers coming in contact with reaction media were glass. The elemental transformation method described here involves a two-step reaction. In the first step, 4.5 liters of 3.7M NaOH were gently refluxed for 5-24h in a round-bottom glass reactor. After cooling to room temperature on a chilled water bath, the pH was adjusted slowly to slightly acidic (pH 4-5) with 1:1 HCl under gentle stirring. The solution became turbid and a white precipitate began to form early in the neutralization process. It is important to avoid significant warming up of the solution. The best approach is to perform the neutralization on a chilled water bath and keep the temperature at around 20°C.

From the slightly acidic pH, the mixture was re-adjusted to mildly alkaline by using 1M NaOH until pH8 was reached. After stirring was stopped, the supernatant slowly cleared and a white precipitate settled out. After the precipitate settled overnight, the supernatant was carefully aspirated off using a peristaltic pump. The precipitate was re-suspended in 8L of deionized water and allowed to settle overnight again. The settled precipitate was transferred into 1L centrifuge tubes with deionized water and spun at 3,500 rpm for 35min in a Sorvall model RC3B centrifuge. The precipitate was washed three more times by re-suspension in deionized water to remove residual salts, and spread out on a glass tray to air dry. Subsequently, it was heated at 70°C for 7h to reach a constant weight and then was weighed. The granular, soft white material was ground to a fine powder in a porcelain mortar and stored in a plastic jar at room temperature. The second catalytic step involved heating the white precipitate to 1,000°C for 1h in a Sentrotech STT-1600 tube furnace in an air atmosphere. SEM-EDS analyses were performed using a Philips Quanta 600 instrument.

Results and Discussion

In a new theory of the atom and atomic processes,^{4,5} we proposed that the atom is a complex electromagnetic waveform with constituents that form a balanced, coupled system. We also suggested that the atom should be treated as a whole, regardless of whether chemical or nuclear reactions are concerned. For this reason, we have introduced the term low energy atomic transformation as opposed to the currently used nuclear reaction to describe the synthesis of new elements under conditions similar to chemical catalysis. As the atom is formed out of the space lattice by electromagnetic pressure waves,^{4,5} the atom may also be transformed (transmuted) by electromagnetic force alone.

A large body of evidence is now accumulating on low energy nuclear reactions demonstrating that electromagnet-

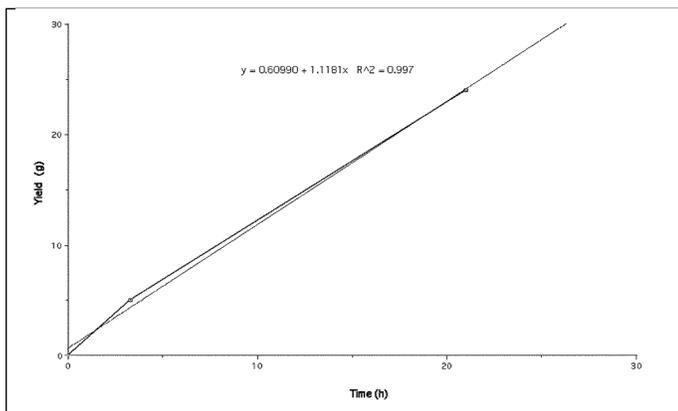


Figure 1. Time curve of the formation of the white precipitate.

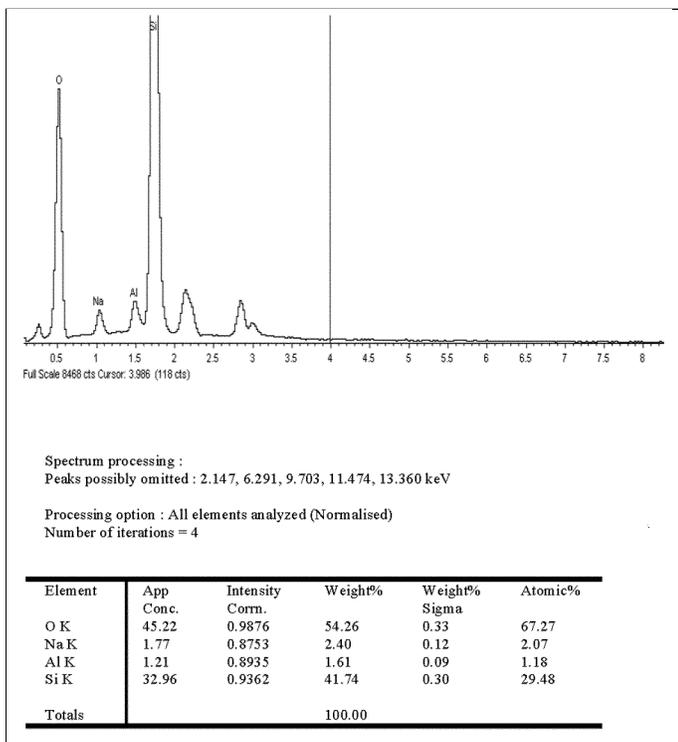


Figure 2. SEM-EDS analysis of the white precipitate.

ic effects may be sufficient to achieve atomic transformation.¹⁻³ As chemical reactions are electric, we reasoned that the high ionic/electric activity of extreme pH could be sufficient to drive atomic transformation reactions. Heating the reaction mixture amplifies the electric activity of high pH and should thus increase reaction rates.

To study whether atomic transformation may occur in a heated NaOH solution, we first set up the reflux of an aqueous 3.7M NaOH solution for increasing times (Figure 1).

We also hypothesized that the reaction product could become enriched in silicon because this element resides at wave amplitude of the fifth octave in the spiral periodic table of elements⁶ and so it is a potential end product of the transformation of sodium. Therefore, after neutralization with acid, the silicon-rich reaction product should precipitate out. In fact, we found a white precipitate forming early in the neutralization process. No precipitate forms before boiling takes place. For neutralization, we used both acetic and hydrochloric acids and found that HCl neutralization yields a more robust precipitate. Despite this, settling of the precipitate takes a long time and even with centrifugation a

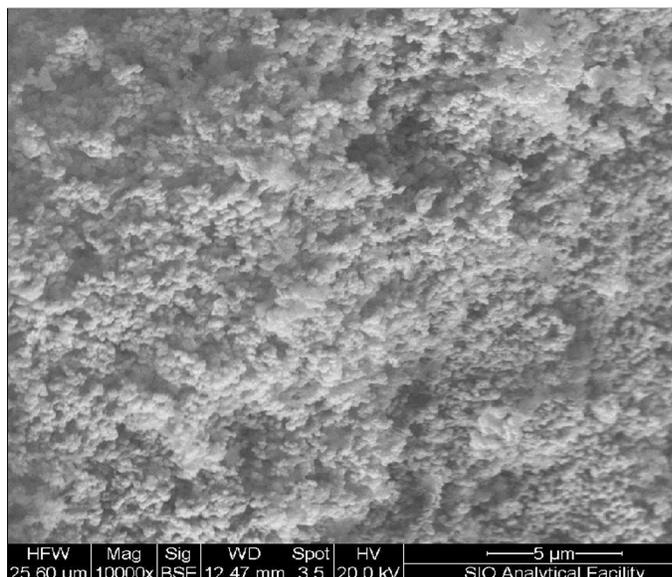


Figure 3. SEM image of the white precipitate.

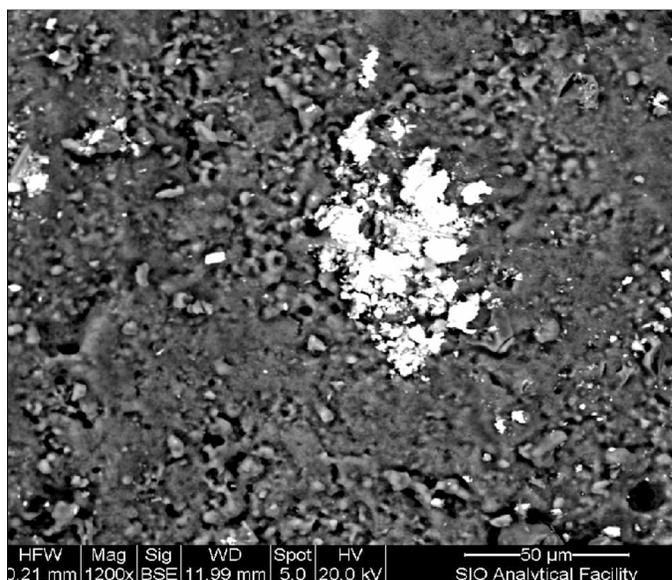


Figure 4. SEM image of the heated white precipitate.

small loss of fines occurred. The precipitate was subsequently dried at 70°C and weighed.

We noticed a minor breakdown of the glass material of the reaction vessel, and an average mass loss of 2g of the reaction flask over a 24h refluxing. This is just one-tenth of the amount of precipitate obtained during the reaction. In the 5h reactions, an average weight loss was observed of 0.9g of the reaction vessel. The average yield of the white precipitate in three reactions was 20.1g. The amount of precipitate generated in the reaction mixture increased nearly linearly with the boiling time, indicating that the reaction potential was not exhausted over 24h (Figure 1).

The elemental composition of the white precipitate differs substantially from that of the starting neutralized NaOH as well as the glass material of the reaction vessel. In Table 1, the compositions of the starting neutralized NaOH, the white precipitate and the reactor glass material were compared by ICP-MS. Analysis of the white precipitate by SEM-EDS (Figure 2) and ICP-MS (Table 1) demonstrated a high concentration of silicon that was not present in the starting reagents. In fact, the silicon concentration in the HCl neu-

tralized NaOH solution at zero time was merely 1.5ppm, consistent with ACS grade chemicals. The concentrations of magnesium, aluminum and calcium were also greatly increased compared with the starting reagents. As 666g of NaOH yielded 20.1g of precipitate, a conversion factor of 33.13 can be used to estimate the relative concentration changes of elements.

The data demonstrate that Mg, Ca, Al and Si appeared (likely in the form of a mixed sodium silicate compound) as the main new constituents during boiling of NaOH. The reactor glass contributes just 8% of the silicon content of the white precipitate. The consumption of Na during reflux was also evident. In addition, the concentration of a number of other elements increased to varying degrees in the white precipitate relative to time zero. Among these, the greatest increases were shown by Cu, Fe, Ti, Mn, Zn and Zr. The concentrations of Al, C, Na and Si in the samples were confirmed by X-ray fluorescence.

This observation can be interpreted by our new theory of the atom^{4,5} as well as the theory of spiral periodic table of elements introduced by Russell.^{6,7} He suggested that all elements are aggregates of light units progressing through their evolutionary cycle of disappearance and reappearance. In other words, all elements follow a similar life cycle and therefore stable elements do not exist. According to Russell, all elements of matter are positioned along a nine-octave sine wave cycle of motion. Each octave has seven tones (elements) plus a "supertone" noble gas that records all information of elements of its octave. Atoms can be considered merely as various states of motion of one cosmic substance, and are locked into their energetically permitted positions on their octave waves.

In the reflux reaction, high purity NaOH was used which contains sodium, the element consumed during reflux. Sodium is positioned as the first element of the fifth octave of the spiral periodic table of elements.^{6,7} Silicon is at wave amplitude of the fifth octave, *i.e.* it is the element of highest orbital velocity, the highest melting point, the most compact crystallization, and the hardest one among the elements of the fifth octave.

As objects of matter can be considered to be accumulations of electric energy,^{5,6} elements may be converted into each other by the proper injection of electric energy, which can switch an element's gyroscopic plane of motion to the next locked position on its octave wave, or up to octave wave amplitude or even further up into higher octaves.

In our atomic transformation reaction, we have relied on the high ionic/electric activity of extreme pH to inject the electric pressure necessary to cause a switch of the gyroscopic sodium atom into other locked positions on its octave wave, and thus transform it into Mg, Al and Si at increasing concentrations in the very same order. Heating is necessary because heating destabilizes the normally locked gyroscopic oscillatory motion of elements, and facilitates transition into other locked positions that correspond to other elements.

We have tested whether the white precipitate had an autocatalytic effect on itself and could give rise to previously absent elements. We heated 0.2g of white precipitate in a platinum crucible at 1,000°C for 1hr in air atmosphere. On SEM-EDS analysis, the heated sample showed significant composition changes compared to the starting sample

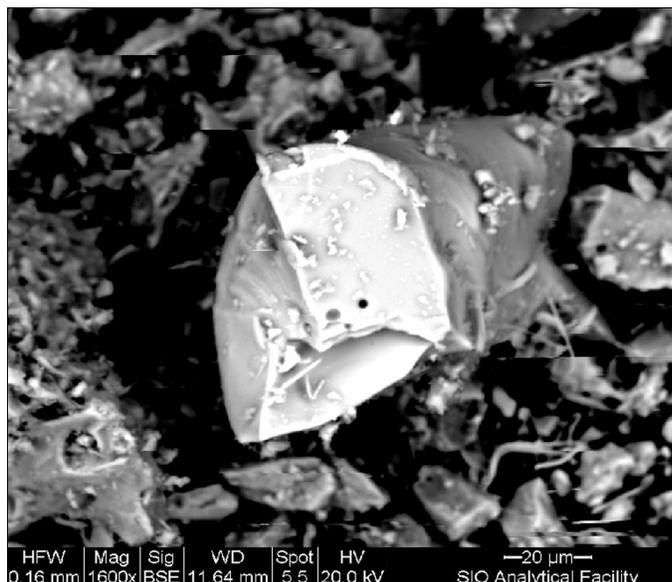


Figure 5. SEM image of crystal 1.

Table 1. Elemental compositions of the zero time neutralized NaOH, the white precipitate and reactor glass.

Neutralized NaOH		White precipitate				Reactor glass material			
	ppm		ppm		ppm		ppm		ppm
							C	4,200	
Al	0.63	Mo	0.005	Al	20,000	Mo	0.12	Al	14,200
Sb	ND	Nd	ND	Sb	0.49	Nd	0.43	Sb	0.44
As	ND	Ni	0.1	As	ND	Ni	250	As	0.43
Ba	0.18	Nb	ND	Ba	3.8	Nb	ND	Ba	7.9
Be	ND	Os	ND	Be	0.15	Os	ND	Be	0.13
Bi	ND	Pd	ND	Bi	ND	Pd	0.15	Bi	ND
B	1.3	P	ND	B	590	P	10	B	24,600
Br	ND	Pt	ND	Br	ND	Pt	ND	Br	ND
Cd	ND	K	11	Cd	0.08	K	480	Cd	ND
Ca	0.49	Pr	ND	Ca	2,100	Pr	0.11	Ca	265
Ce	ND	Re	ND	Ce	74	Re	ND	Ce	1.8
Cs	0.007	Rh	ND	Cs	0.27	Rh	ND	Cs	1.12
Cr	0.031	Rb	0.005	Cr	7.3	Rb	0.82	Cr	7.7
Co	ND	Ru	ND	Co	6.4	Ru	0.1	Co	1.29
Cu	0.006	Sm	ND	Cu	12	Sm	0.08	Cu	0.89
Dy	ND	Se	ND	Dy	0.1	Se	ND	Dy	0.13
Er	ND	Si	1.5	Er	0.09	Si	400,000	Er	0.11
Eu	ND	Ag	ND	Eu	ND	Ag	2.7	Eu	ND
Gd	ND	Na	66,000	Gd	0.2	Na	43,400	Gd	0.13
Ga	ND	Sr	0.053	Ga	2	Sr	14	Ga	1.26
Ge	ND	Ta	ND	Ge	0.1	Ta	ND	Ge	1.13
Au	ND	Te	ND	Au	ND	Te	ND	Au	ND
Hf	ND	Tl	ND	Hf	7.6	Tl	ND	Hf	8.69
Ho	ND	Th	ND	Ho	ND	Th	0.37	Ho	ND
I	ND	Tm	ND	I	ND	Tm	ND	I	ND
Ir	ND	Sn	ND	Ir	ND	Sn	1.1	Ir	ND
Fe	0.27	Ti	ND	Fe	450	Ti	84	Fe	233
La	0.019	W	ND	La	0.92	W	ND	La	0.9
Pb	ND	U	0.004	Pb	18	U	0.47	Pb	1.39
Li	0.018	V	ND	Li	0.28	V	0.09	Li	9.23
Lu	ND	Yb	ND	Lu	ND	Yb	0.16	Lu	ND
Mg	0.038	Y	ND	Mg	880	Y	0.64	Mg	33
Mn	0.019	Zn	0.035	Mn	17	Zn	32	Mn	5.89
Hg	ND	Zr	ND	Hg	ND	Zr	510	Hg	ND

ND not detectable

(Figures 3 and 4). Numerous bright, highly electron-dense crystals appeared, highly variable in appearance and elemental composition (Figures 4-6 and 7-9). These were previously undetectable.

The elemental composition of the silicate matrix in Figure 4 also differs from that of the starting white precipitate (Figure 2). The concentration of Na increased, with Mg and Ca appearing as prominent new elements (Figure 8). Some loss of Si was also evident. We have performed the analysis of a bright, electron dense cluster located in the center of Figure 4. Analyses show high Fe concentration, accompanied by Cr, Ni, Mn and Cu (Figures 10A and 10B). Subsequently, we selected stand-alone crystals for analysis. Crystal 1 contains high concentrations of Al and Zr (Figures 5 and 9). Crystal 2 (Figure 6) is mainly composed of Au and Pd (Figure 11), while crystal 3 (Figure 7) is composed of almost pure W (Figure 12). Au and W were both undetectable in the white precipitate.

These observations indicate an innate catalytic ability, and raise the possibility of the *de novo* synthesis of a wide

range of metals of industrial significance. Possibly, the white precipitate is an “electrically activated” substance, a property common to catalysts, capable of stimulating atomic transformations of its own. Although the overall yield of elements of higher atomic numbers is low, this should be possible to improve with further research.

The results confirm our hypothesis that atomic transformation requires electric pressure along with heating, which may be Nature’s method of synthesizing matter. We have also confirmed fundamental observations of the spiral periodic table of elements.^{6,7} In agreement with Russell’s theory, we have redefined atomic transformation as atomic rather

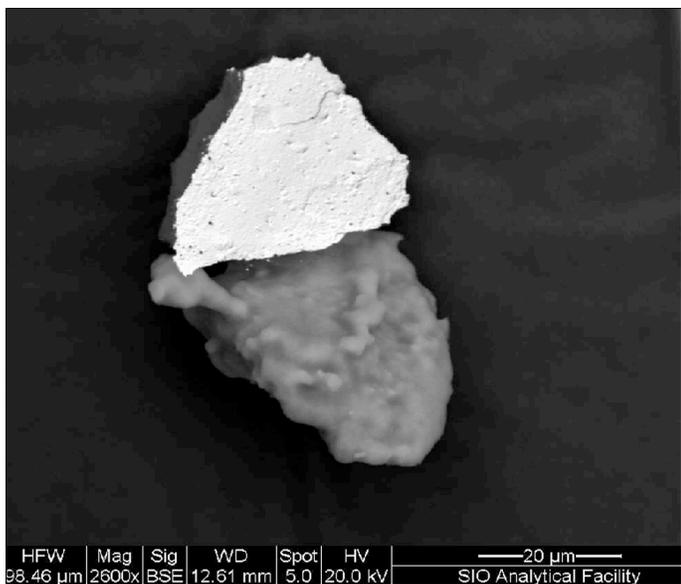


Figure 6. SEM image of crystal 2.

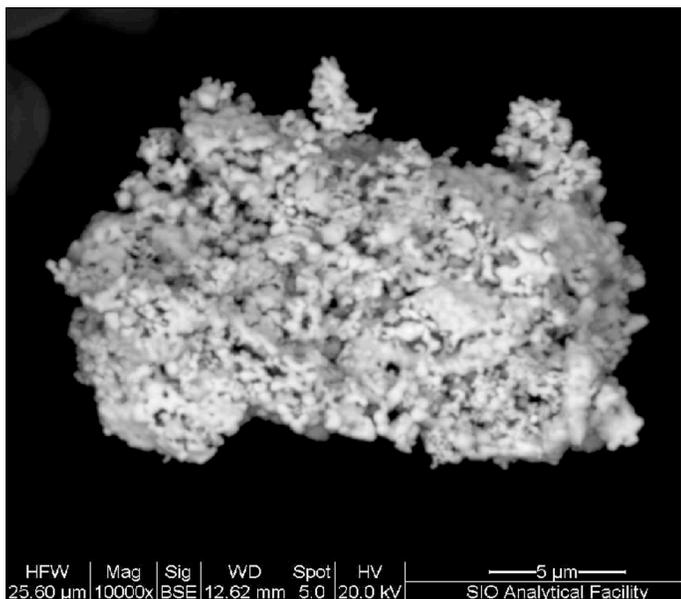


Figure 7. SEM image of crystal 3.

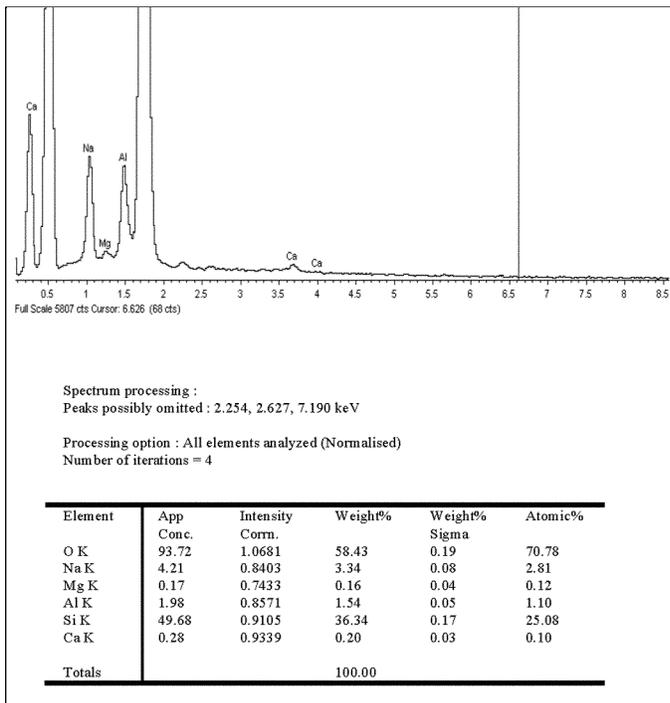


Figure 8. Matrix composition of the heated precipitate.

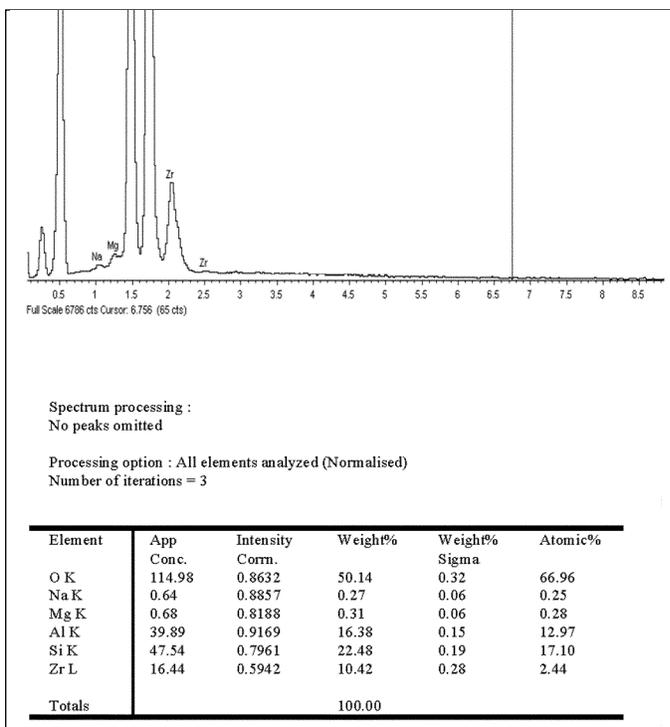
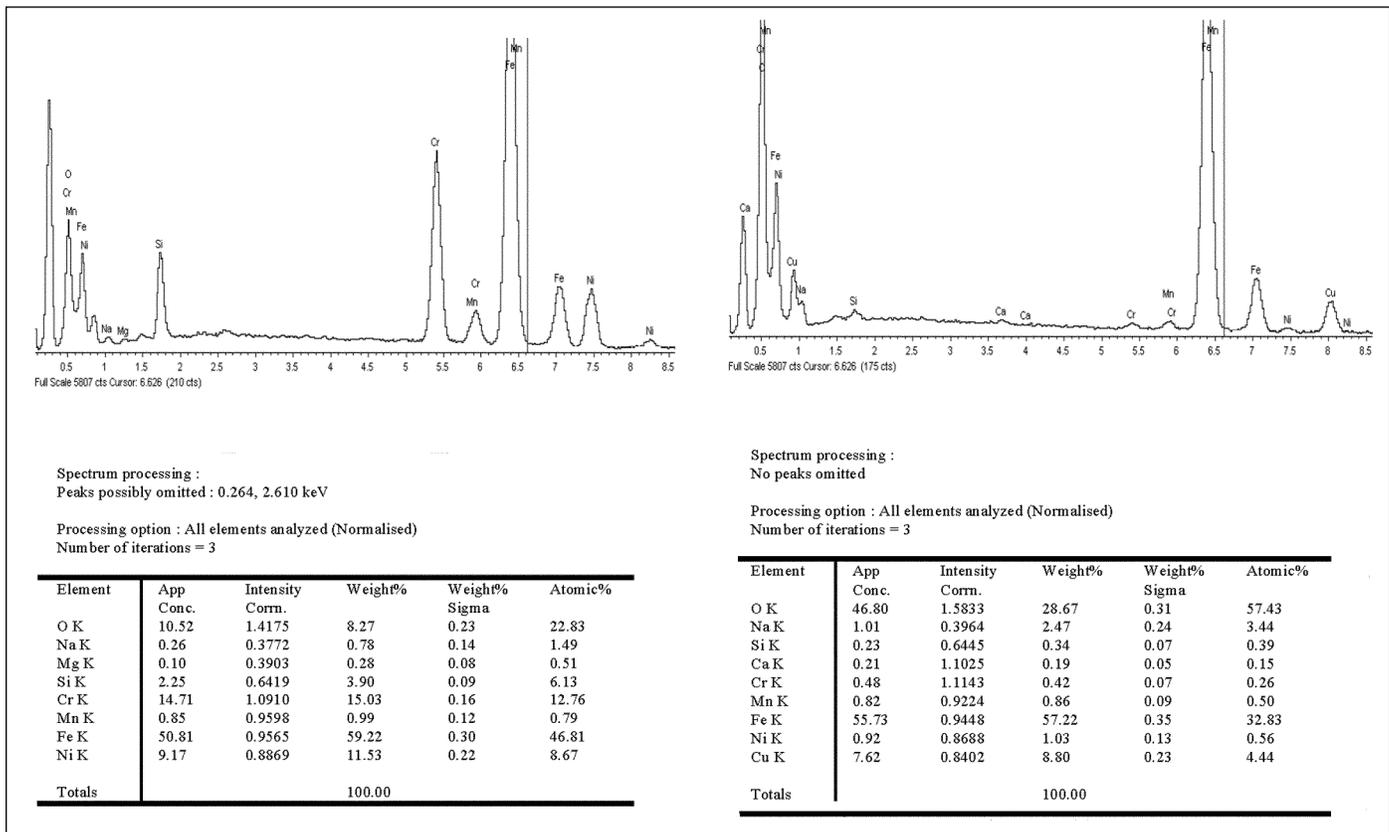


Figure 9. SEM-EDS analysis of crystal 1.

than “nuclear”⁵ and now propose that the nuclear atom hypothesis is inconsistent with Nature’s processes. If atomic bodies are generated by external electromagnetic pressure waves,^{4,7} the atom cannot have an energy of its own capable of attracting from the inside, *e.g.*, from a solid nucleus. Instead, the atom should be viewed as a wound-up spring that seeks equilibrium with its low-pressure environment,

and will do so unless maintained by a continuous input of energy. The physical nature of such an energy source remains to be determined.

We have presented a method for the rational design of atomic transformation that is feasible under conditions typical of chemical catalysis. Our results also suggest that the ancient art of alchemy could have had substance. Acidic



Figures 10a and 10b. Two areas analyzed in the bright cluster of Figure 4.

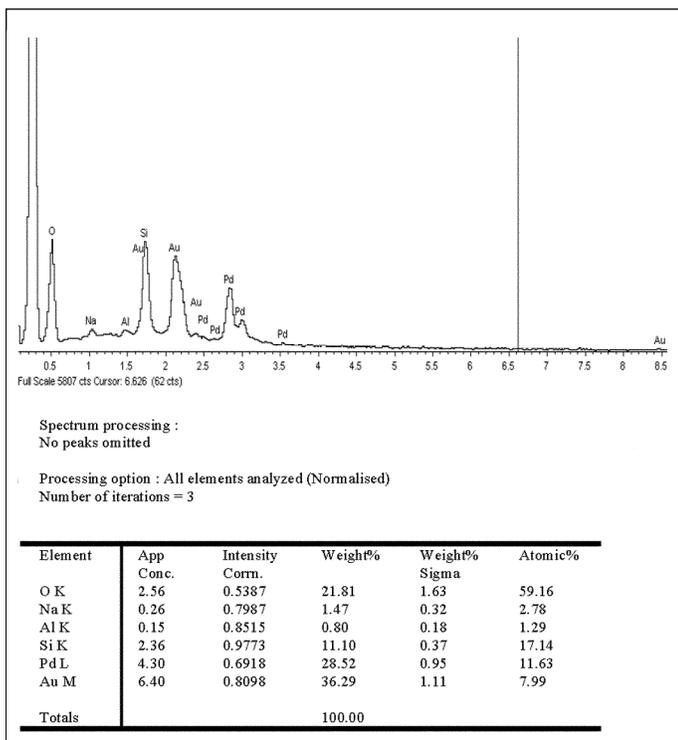


Figure 11. SEM-EDS analysis of crystal 2.

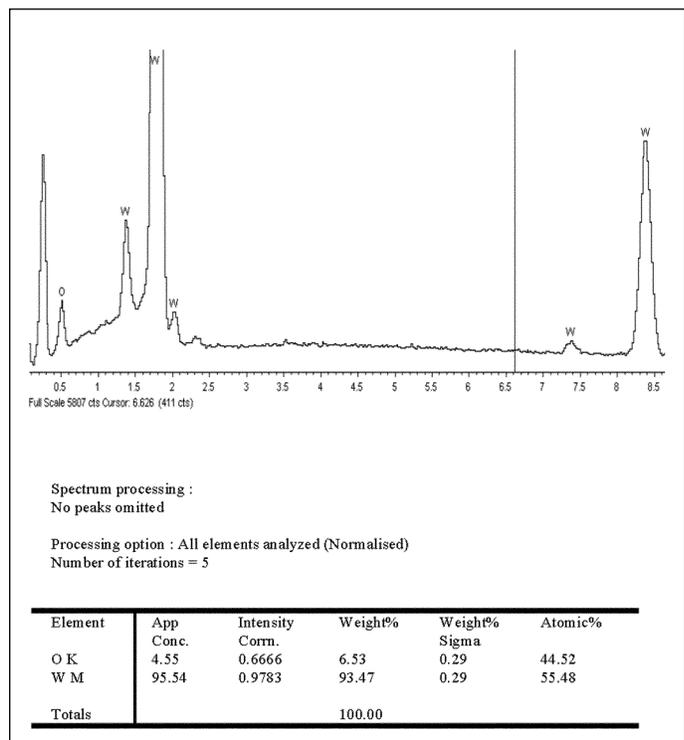


Figure 12. SEM-EDS analysis of crystal 3.

(vinegar) and basic (lye) chemicals have been known since ancient times. Silicate compounds are widely distributed in Earth's crust. High temperatures and alkaline as well as acidic conditions are also present there. Therefore, the geochemical conditions are given for the ongoing *de novo* synthesis of elements in Earth's crust, and it is possible that some marine chemicals may actually help build continents.

Kervran described that egg-laying hens, when fed with calcium-deficient but potassium and silicon-containing diet, still laid hard-shell eggs.⁸ In our experiment, calcium formation was also observed in the white precipitate, as well as during its subsequent heating. We have demonstrated the formation of elements of higher atomic numbers during heating of the white precipitate. Living organisms have the ability to catalyze reactions that would require temperatures of 1,000°C by non-biologic methods of chemistry. It is possible that an electrically activated silicon compound, when ingested, could be transformed into elements of higher atomic numbers inside living cells and thus provide a novel avenue of mineral supplementation.

This study opens the possibility of low energy controlled synthesis of elements, and demonstrates the need for a revision of our theoretical framework of atomic processes. Further studies in this field could help resolve a number of environmental problems including the accumulation of radioactive waste, as well as pollution caused by mining operations. It appears that new theoretical considerations of the atom may well propel physical and material sciences into a new era of inconceivable possibilities.

Acknowledgement

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Peter Grandics has an MS in chemical engineering and a Ph.D. in biochemical engineering. He has worked in the fields of biomedical research and recently in physics focusing on new energy technologies. He intends to help find answers to the continuing mystery of alchemical references.

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