

From Alchemy to Chemistry: Gathering, Inspiration, and Synthesis

Hiroto Yamanaka



The image was created using Gemini.

Are you easily influenced? I'm sure that I'm easily influenced. What makes me a scientist is one character in a video game. Her name is Sophie Neuenmuller, and she is a great alchemist. Inspired by her, I'm now working on an interesting topic in chemistry. Simply put, my topic is related to the similarity between "liquid to gas" and "solid to solid". Current refrigerants use the heat absorbed when liquid changes to gas. However, these gases or liquids can leak and contribute to global warming. Therefore, I want to make a solid powder that can replace gas in a refrigerator. Some compounds have good characteristics for this objective. Let me first introduce Sophie's story before explaining my story and research.

The story begins when Sophie meets an old book named Plachta, an expert in alchemy who has lost some of its memory. Sophie tries to recover Plachta's memory by

writing new recipes in the book. Her main activities are gathering materials, thinking of recipes, and making items. These items, such as medicine or bombs, are used to help people in the town. She comes up with new ideas through interaction and gradually gains knowledge of alchemy.

Her personality is very bright and cheerful. She wants to be an alchemist like her grandmother and tries a lot toward the goal. Plachta is a good teacher, and they have a relationship between master and disciple. At the same time, they are good friends and family. She wants to make everyone happy with alchemy and especially wishes for Plachta's happiness. She loves alchemy and does her best for this purpose.

As I explained so far, Sophie is a hard-working and cheerful person. I really like her story and personality. Next, I would like to talk about my story from playing this video game to deciding on a career.

I heard of the character for the first time when I was a high school student. At that time, I was busy studying for entrance exams, and I didn't have enough time to play video games. After passing the exam, I bought the game as a reward for myself. The game was very interesting and impressive. The complex game system was challenging and great: It is necessary to think deeply about passing desirable features of raw materials to items. I feel a sense of achievement when I succeed in making good items. (I strongly recommend that you play this game at least once!)

In the second year of university, I had to decide on a major from many choices of faculty and departments. I hadn't decided even on literature or science: I was interested in almost all the lectures in the first year. Then I happened to remember the game and character. Her cheerful personality, her dream of everyone's happiness, and her relationship with Plachta were very fascinating. I wanted to be a person like her!

Therefore, I decided to major in chemistry.

To summarize my story, I was easily influenced by the video game character and chose the department of chemistry. The influence on my life was significant, and I'm happy with this situation. My daily activities are something like what she does: buying reagents, thinking about what is needed to achieve my goals, and synthesizing them. Finally, I would like to introduce my research. As I said, the topic is related to the similarity between "liquid to gas" and "solid to solid".

Let's think about water evaporation. Water can change its properties by alternating between liquid water and water vapor. The volume of vapor is about 1,700 times larger than that of liquid. When vapor with such a large volume is compressed, it turns into liquid. Conversely, the liquid turns back into vapor when the pressure is released. At that moment, heat is absorbed from the surroundings. The same things happen with liquids other than water, and this heat absorption is used in current refrigerants.

How can we achieve the same result using only solids? Solid doesn't seem to change by such a large volume when pressure is applied. The important thing is that some solids can change their properties after being compressed, even if they remain solids. I'm working with such a compound. It contains metal ions such as manganese and iron, which have a "charge". At room temperature and ambient pressure, manganese ions have a 2+ charge, and iron ions have a 3+ charge. However, applying pressure changes this situation into manganese ions with a charge of 3+ and iron ions with a charge of 2+. By releasing pressure, it returns to the original state while absorbing heat.

These changes of "liquid to gas" and "solid to solid" are both called "phase

transition". This amazing similarity makes it possible to use solid as a refrigerant. There are a lot of things to consider for practical use: (1) large heat absorption, (2) long-term use, (3) low pressure, (4) wide operating temperature, (5) abundant materials, and so on. I'm now trying to make the powder fit for this objective, especially (3) and (4). One strategy is to partially substitute manganese or iron with other metals. The difference in stability of 2+ and 3+ charges may affect their properties.

In conclusion, I have decided on the department of chemistry because I want to become a scientist like Sophie in my favorite video game, and I'm doing my best for research on phase transitions. I'm easily influenced, as shown above, but it is not a bad thing at all: One of the desirable features is that the solid-to-solid phase transition can occur with low pressure. Therefore, I want to make the powder easily influenced like me! My message is that if you are worried about the future, don't hesitate to be affected by anything you like. When you feel anxious about becoming a scientist, please remember this essay.

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Note: I used DeepL and Grammarly to improve my English.