Top-notch colors into the ceramic world

I. Norimat : Innovation as core competency

Norimat is specialized in the production of high performance pieces for cutting edge industries. Based on 15 years of R&D, Norimat is industrializing the SPS process to produce tailor-made products for its clients

The Spark Plasma Sintering process combines pressure and a high intensity current to enhance densification kinetics and allows full densification in a very short time. The heating rate is much higher than usual furnaces. For example, a complete SPS cycle of densification at 1400°C takes less than 60min, compared to several hours for a conventional process. This is achieved thanks to the very high intensity electrical current applied directly through the mold containing the powder. Heating this specific and localized area through Joule effect is much more efficient than heating the entire volume of a standard furnace, allowing heating rates as fast as 600°C/min !

The standard SPS process is described in Figure 1

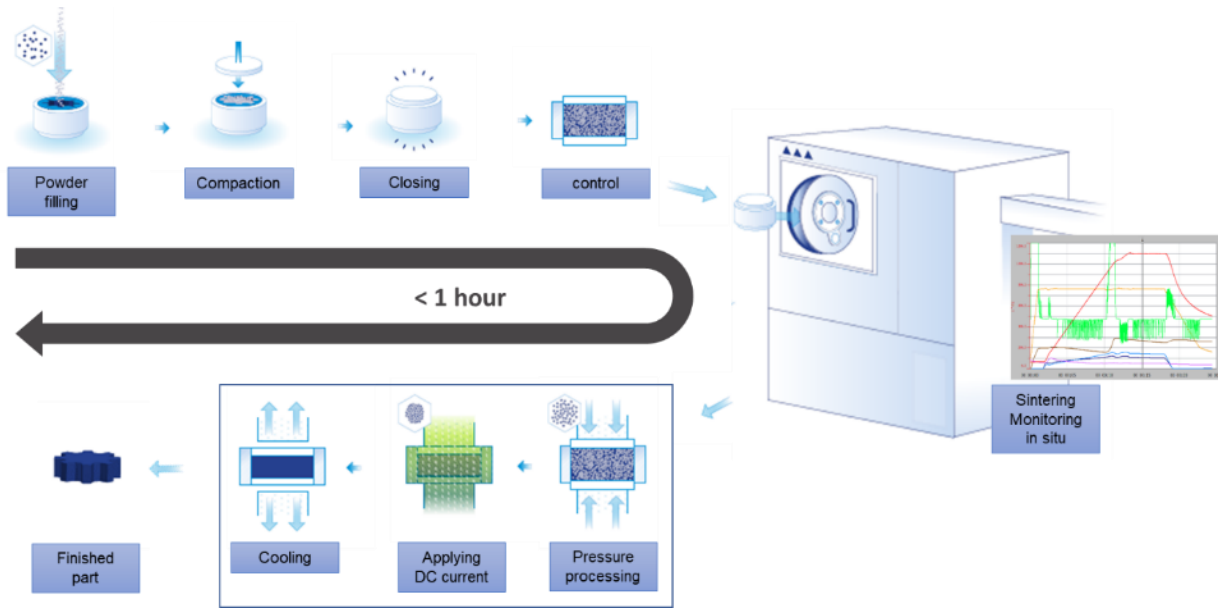

Figure 1 – SPS process Copyright Norimat SAS

SPS is already widely used in industries requiring high performance and innovative materials, such as aeronautics, defense, micro-electronic or medical. For a few years now, Norimat has offered the versatility and benefits of this unique process to the audacity of the high jewelry and high watchmaking designers.

II. On-demand warm and bright colors

Figure 2 – Colored ceramic watch bezels Copyright Norimat SAS

For a long time, the color range of technical ceramics has been utterly restrained because of the manufacturing process conditions. The high temperature sintering step was so demanding that most pigments are partly or completely destroyed during the process. Most pieces exhibiting pale or fade colors.

On the contrary, pigments are exposed to high temperatures for a very short time with SPS. This quickness and the controlled atmosphere of the furnace are key ingredients for preserving the pigments throughout the entire SPS densification process. SPS allows a much wider range of new pigments to be preserved after sintering and final dense technical ceramics can exhibit unprecedented bright new colors!

As coloration is achieved through pigment mixing, it is present in the entire volume of the pieces. The quickness of the process not only allows new colors to be developed, but it also ensures a very fine microstructure inside the dense material. Thus, our colored ceramics exhibit high mechanical properties such as hardness and fracture toughness to pass any watchmaking most demanding crash tests.

With this in mind, we challenged our technology to reach the most looked up and difficult bright and warm ceramic shades such as red, yellow, orange etc. Our unique expertise got us to not only overcome these challenges but also to go even further, allowing the development of a range of combined colors! We present to you the brightest and richest colored ceramics and some of their combinations! Norimat owns and operates several patents to work on a wide range of colors, patterns and color-assemblies, all exhibiting high mechanical properties.

Figure 3 – Colored ceramic watch bezels Copyright Norimat SAS

III. New textures for new emotions

This technological leap opens the door to a new world of possibilities for audacious ceramic designs.

That is what we tried to achieve in a first series of designs on the astronomy theme. We present to you 3 original creations inspired by Mars, the Moon and Neptune (Fig.4). These marbling effects are obtained combining different pigmented ceramics assembled in a one-step sintering process. This ensures marvelous patterns in the entire volume of the pieces. No machining issues! They are all based on yttria-stabilized zirconia, a well known and widely used technical ceramic with high mechanical properties and good machinability, suitable for any watchmaking criteria.

This intense deep red adorned with acidic yellow carries our imagination towards recent space explorations, isn't it ?! A ceramic with such electrical colors could transfer its energy towards a unique final product, deeply innovative and standing out the competition.

Likewise, the softer and sober colors of our Neptune and Moon creations could blend easily in any type of design, subtly adding the luxury touch of a most definitely unique piece.

Figure 4 – Mars, Moon and Neptune ceramic creations. Copyright Norimat SAS

As you could guess, this is the first step of a whole new universe of possibilities. Keeping our heads in the stars, we would love to put our expertise at the service of other designer's creativity for our next collections of innovative colored ceramics.