

② Preliminary announcement of our new product “Fumed Diamond Powder”

Technical problems to be solved So far, the popular forms of our major product NanoAmando have been 2% aqueous solution and hard hydrogel containing 10~20% of water, but both of these had a few serious drawbacks. Both carried large amounts of water, due to extremely high affinity of water to our nanodiamond, and precluded many applications that are adversely affected by water. The 2% concentration of aqueous solutions is in the safe range for storing under normal conditions, but nevertheless cannot perfectly prevent self-aggregation to occur slowly. Once aggregated, it is difficult to recover high dispersity in conventional laboratories. Hard hydrogel is basically well-aggregated during evaporation of water, hence not really appropriate for any uses.

How did we cope with the problems Although we have advocated to enforce monodispersity, it is not always absolutely necessary to adhere perfect dispersion, but weak aggregation can be acceptable at least to some extent in many applications. Furthermore, we should recognize two types of aggregation, one inherently weak due to random orientation between the aggregating crystal planes^{*1}, and the other inherently strong due to optimized orientation for the maximum interfacial bonding after annealing at high temperature for enough time^{*2}. If we could control the aggregation process to end up with only IICI, the weak bonds may be easily broken by applying weak shearing force or conventional supersonic wave.

Improved milling process Nano-milling in general involves astronomical increase in the number of particles if started from visible particles. Explosive increase in the number of particles is accompanied by the more pronounced increase in the total surface with higher order of magnitudes. In order to accommodate new surface we need more solvent than the starting volume, which may sometimes requires unexpectedly large additional amounts. Therefore it is necessary to estimate the amount of solvent required in the final stage of milling and secure enough amounts (and additional space). If such precaution is omitted, new surface will recombine or viscosity increase to stop the milling. Details of calculation is out of the scope of **News** but will be published elsewhere.

*¹Incoherent interfacial Coulombic interaction, IICI.

*²Coherent interfacial Coulombic interaction, CICI. An interparticle bond in the dimers that survive disintegration process to the last moment belongs this type.

New product The most convenient form to use must be a fine powder, but it is convenient to start from a solution where all the particles are dispersed in random orientation. Hence we thought of the following scheme. An aqueous solution of NanoAmando in good dispersion is frozen quickly so that the random orientation will be kept as it is. Evaporation of water from the frozen solution should give anhydrous powder consisting of very small particles composed of weak aggregates in IICI. We have succeeded in following this scheme to obtain ultra-small powder consisting of IICI aggregate particles. As a similar silica is already in market under the name fumed silica, we also named our new product as fumed diamond.

Starting date of sales: October 10, 2017. The price has not yet been fixed but will be kept to less than 30% higher than hard hydrogels.

Special pre-start event: Call or send e-mail to Mr. T. Ito, New Metals & Chemicals Co. (+81-3-5202-5624 or ito@newmetals.co.jp) for test purchase at a reduced price during a short period between September 15 to 30, 2017. Purchase limited to 5gx2 bottles per person. Scheduled date of shipping: October 10, 2017