High yield separation of metallic and semiconducting carbon nanotubes

Quite simple, quick and scalable method

We have developed a novel separation method of metallic and semiconducting single wall carbon nanotubes (SWCNTs) by agarose gel electrophoresis. We used SWCNT-dispersed gel as a sample of gel electrophoresis and found a drastic improvement in the separation (Figure). In this method, most of metallic SWCNTs moved out from the starting gel and formed the frac. 2, while semiconducting SWCNTs remained in the starting gel (frac. 1). As a result, almost all SWCNTs applied to gel electrophoresis were separated into respective electronic types. Since the new method is quite simple, quick and scalable, it could be suited for industrial production.

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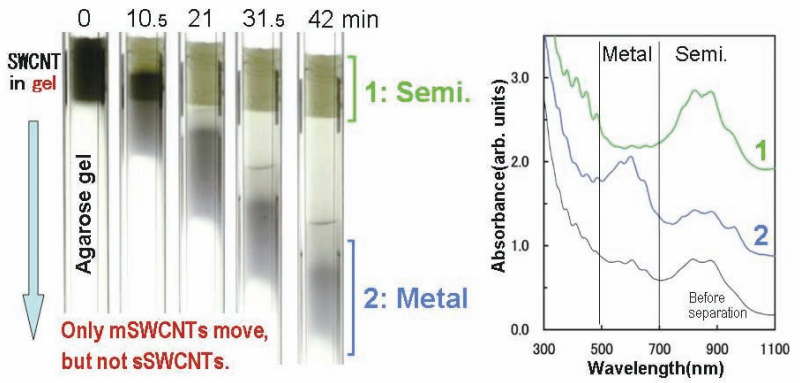

Separation of SWCNT-containing gel by electrophoresis.
(Left) Sequential photographs showing progress of separation.
(Right) Absorption spectra of separated SWCNTs.

Novel manufacturing technology for magnesium alloy sheets

Full-dry hot pressing technology using a diamond-coated die

We have developed a full-dry pressing technology without lubricant for hot pressing of magnesium alloy plates using a diamond-coated die prepared using CVD. Magnesium alloy sheet can be pressed only at elevated temperatures. Therefore, special lubricant that withstands such high temperature is indispensable. Along with raising lubricant costs, oil mist generated from lubricants at high temperature degrades the work environment. Serious problems related to environmental concerns also emerge, such as the necessity of product cleaning after processing and disposal of wash water. Moreover, burned lubricant requires frequent maintenance of dies, which pushes up costs.

Dry pressing technology with a diamond-coated die needs no lubricants using the characteristic of ground diamond surfaces with a very small friction coefficient. Moreover, excellent heat resistance of diamond demonstrates satisfactory lubrication performance and coating durability up to a high temperature of 320 °C , which is a pressing temperature of magnesium alloys of poor workability. Dry manufacturing without lubricant realizes a long-cherished ambition in this field.

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AZ31, thickness 0.8 mm

Non-combustible alloy AMX602, thickness 0.8 mm

Drawn cups after dry hot drawing using a diamond coated die and a blank holder.
(left:AZ31, thickness 0.8 mm, right:non-combustible alloy AMX602, thickness 0.8 mm)