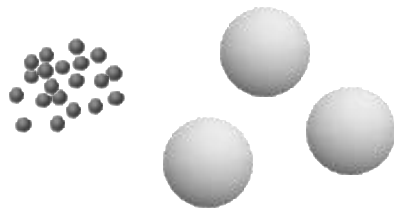
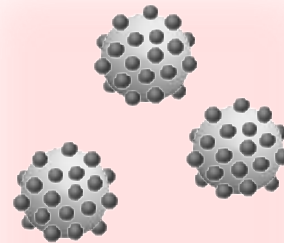


次世代モノづくりのための粉末設計



原料粉末

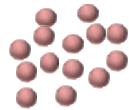
静電吸着



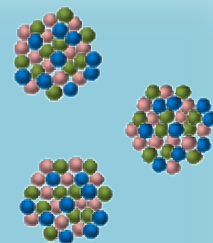
複合粒子

次世代材料

3 D



静電集積



複合顆粒

2 D



composite

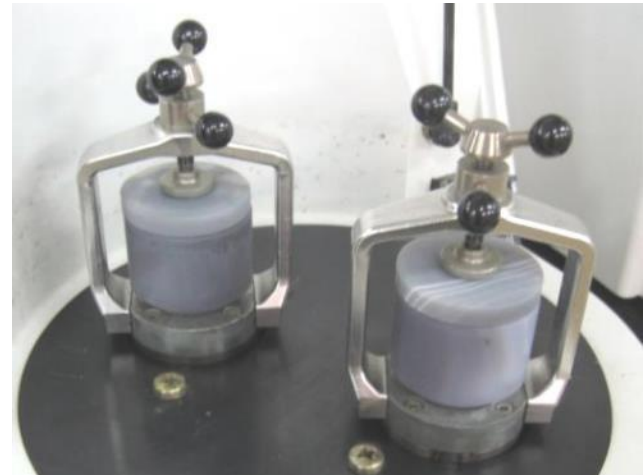


(豊橋技科大) 武藤浩行
(岐阜セラミックス研究所) 尾畑成造

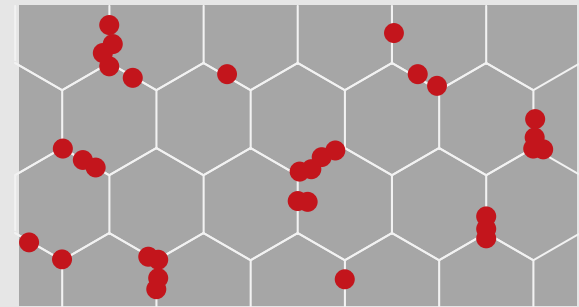
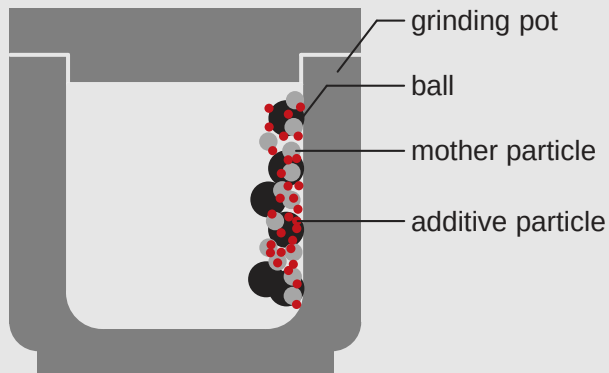
従来法による粉末冶金プロセス

〈Mechanical Mixing〉

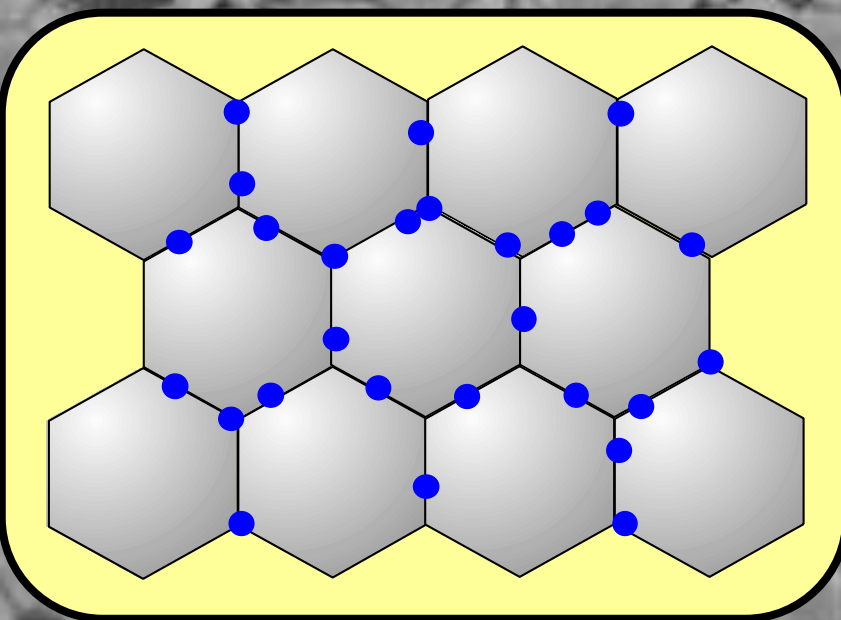
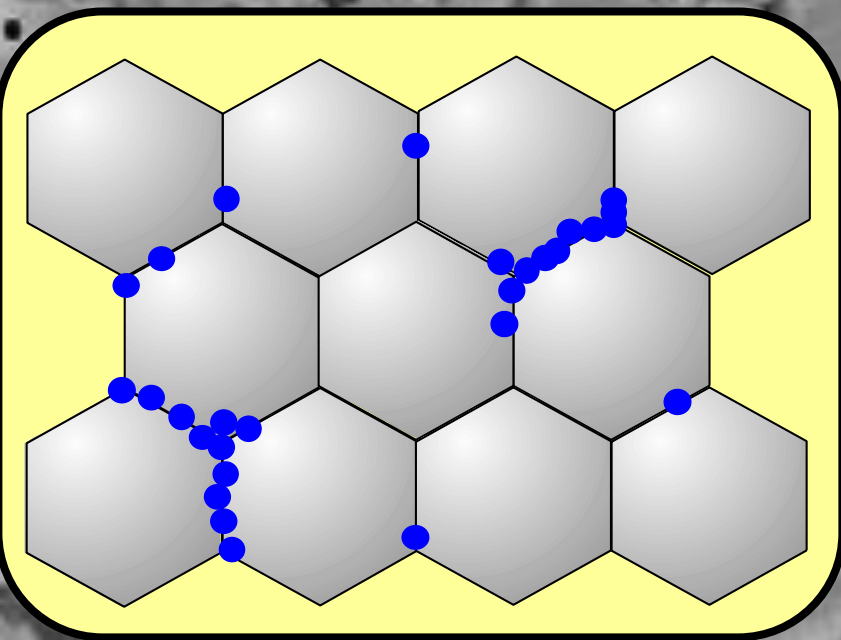
- Contamination
- Long Operation Time
- Small-Amount



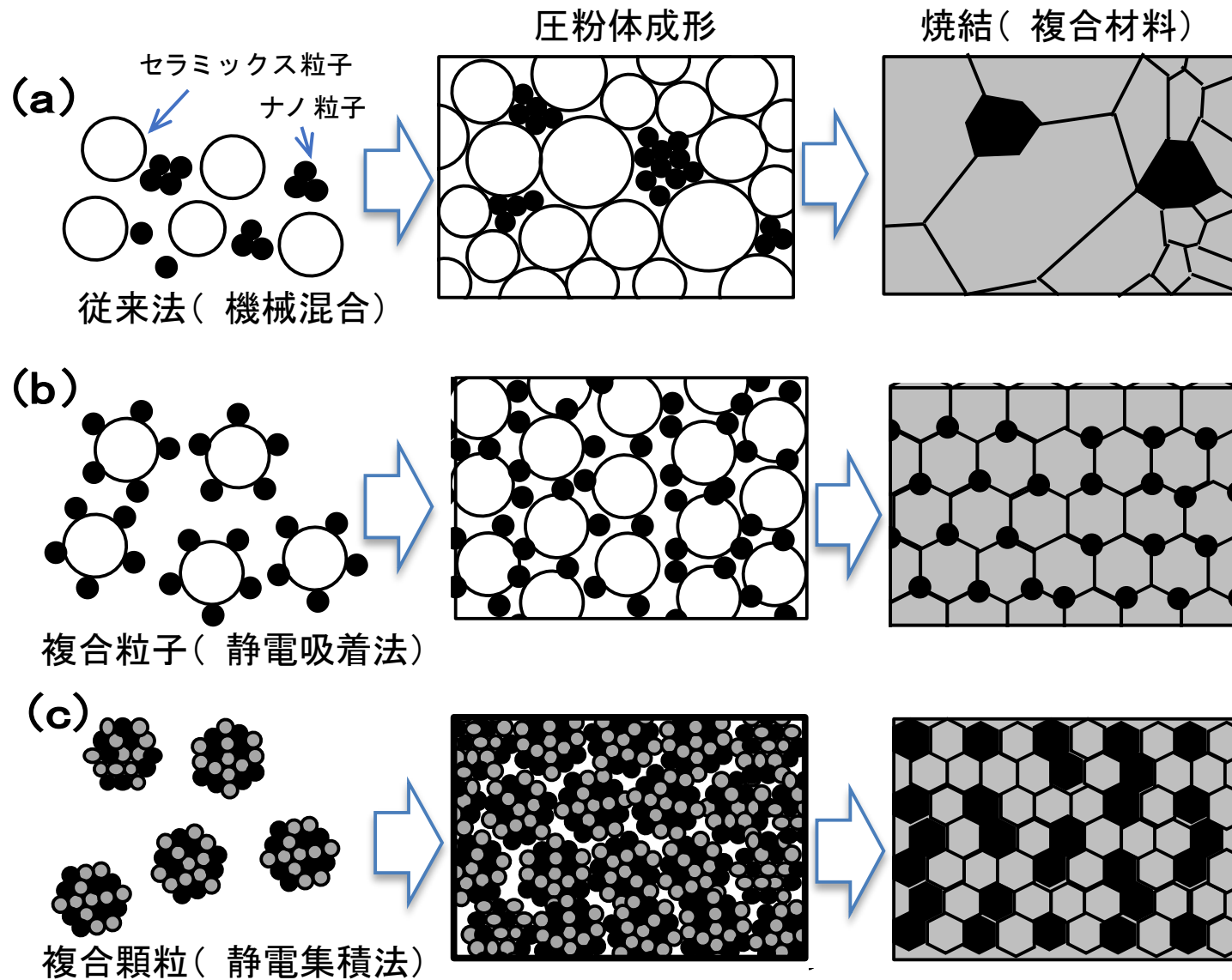
Ball Miring Process (FRITSCH Corp.)



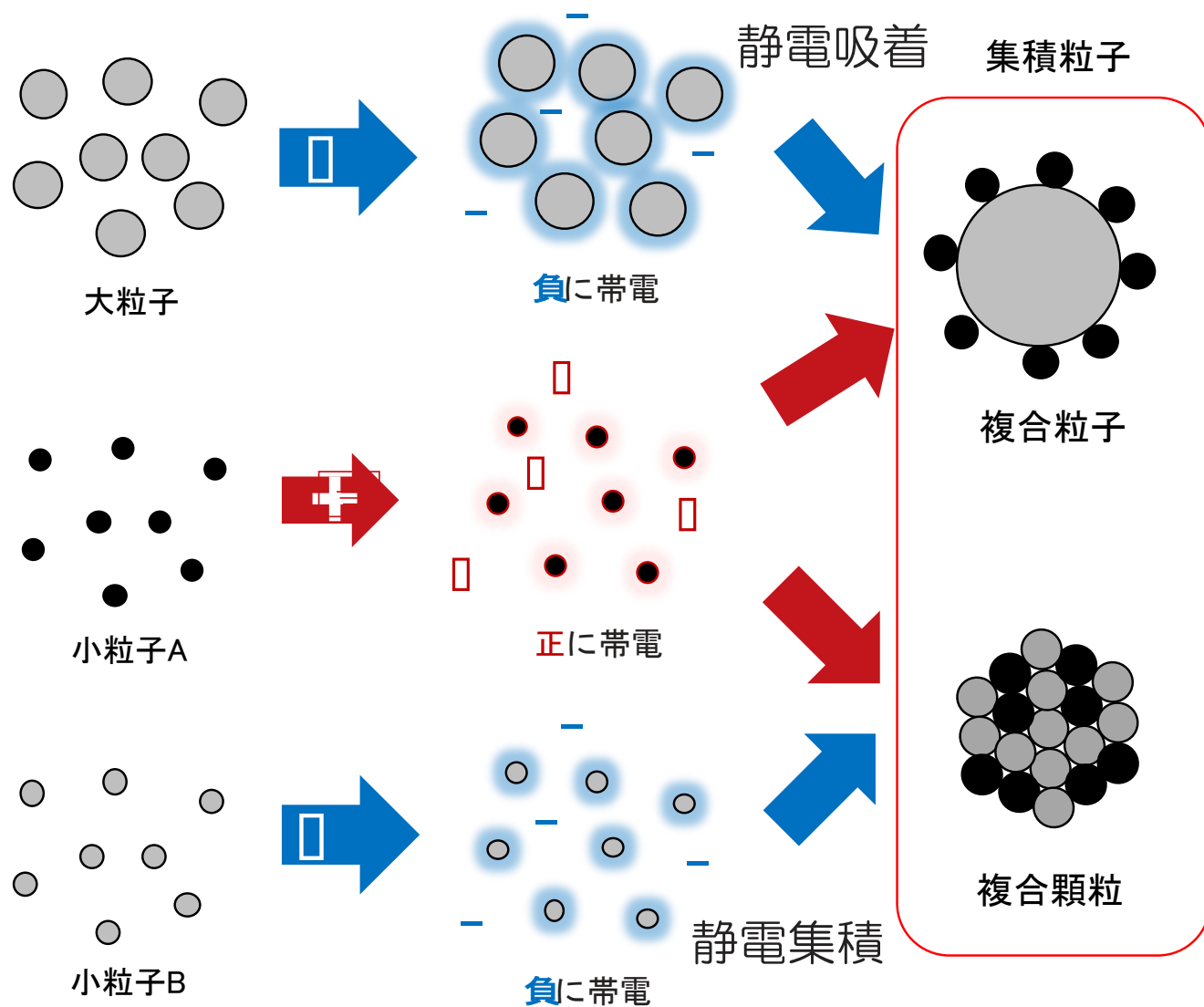
Microstructure



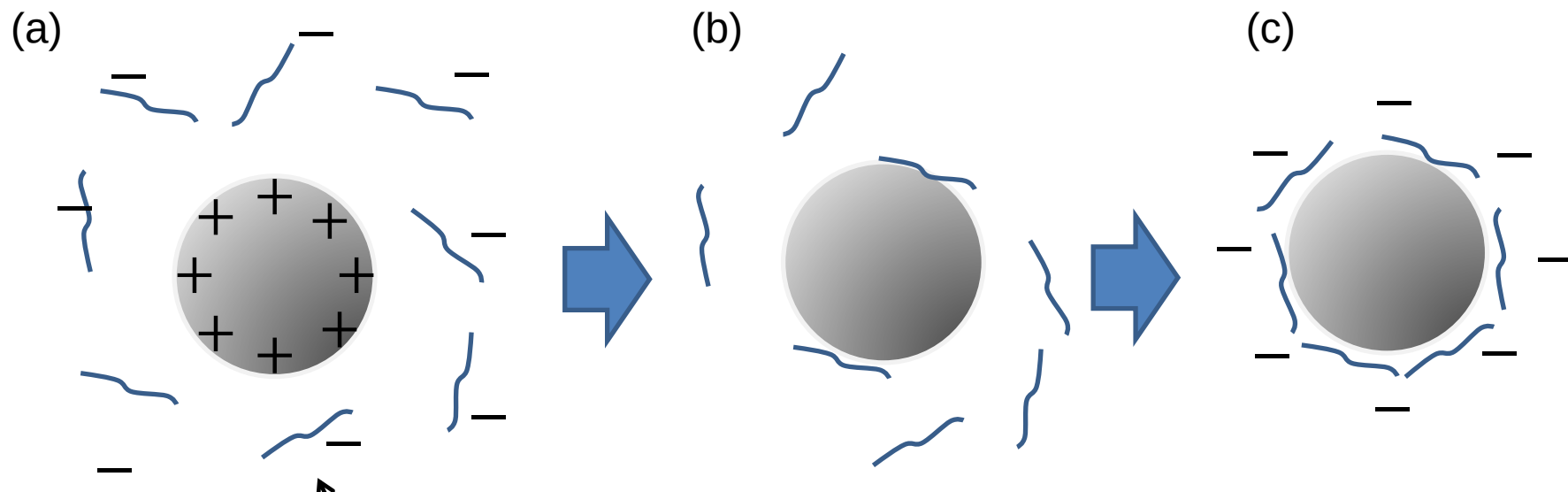
粉末冶金による材料開発



静電相互作用による複合化と顆粒化

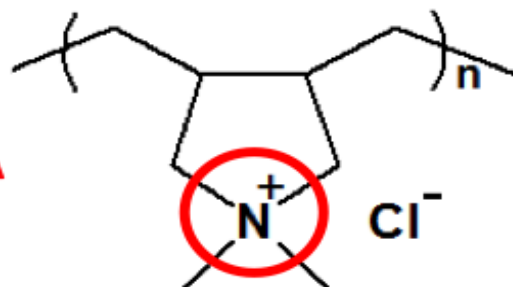


静電相互作用発現のための電荷調整



Polycation

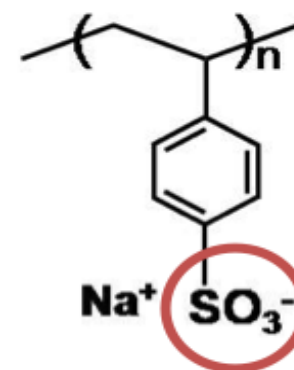
PDDA



Poly(diallyldimethylammonium chloride)

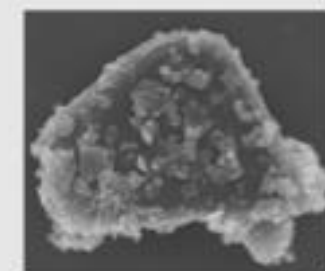
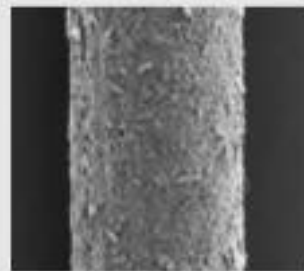
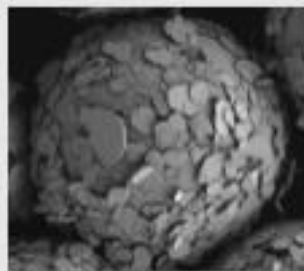
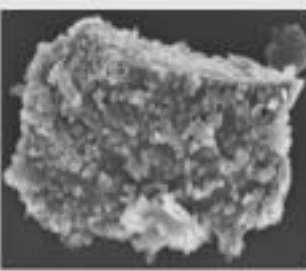
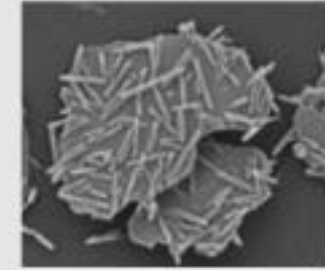
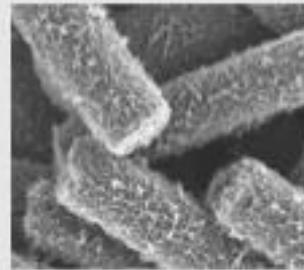
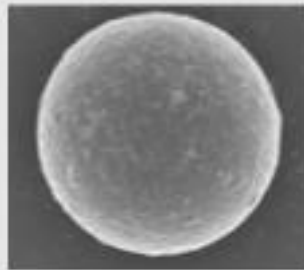
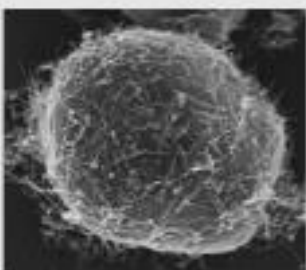
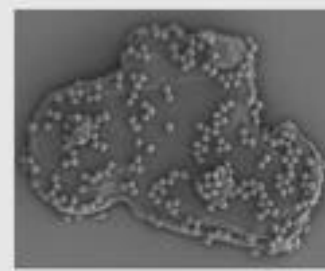
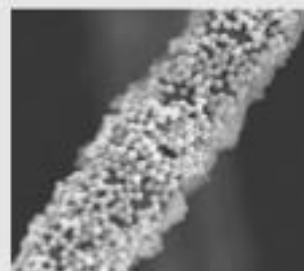
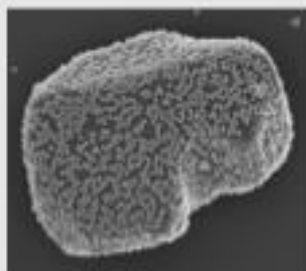
Polyanion

PSS

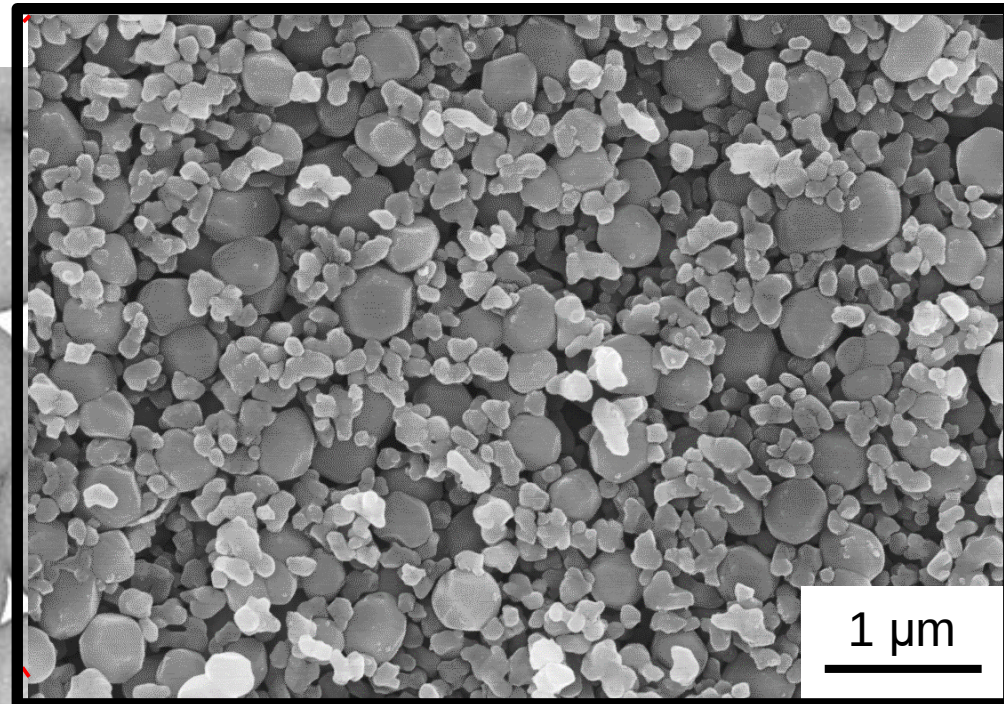
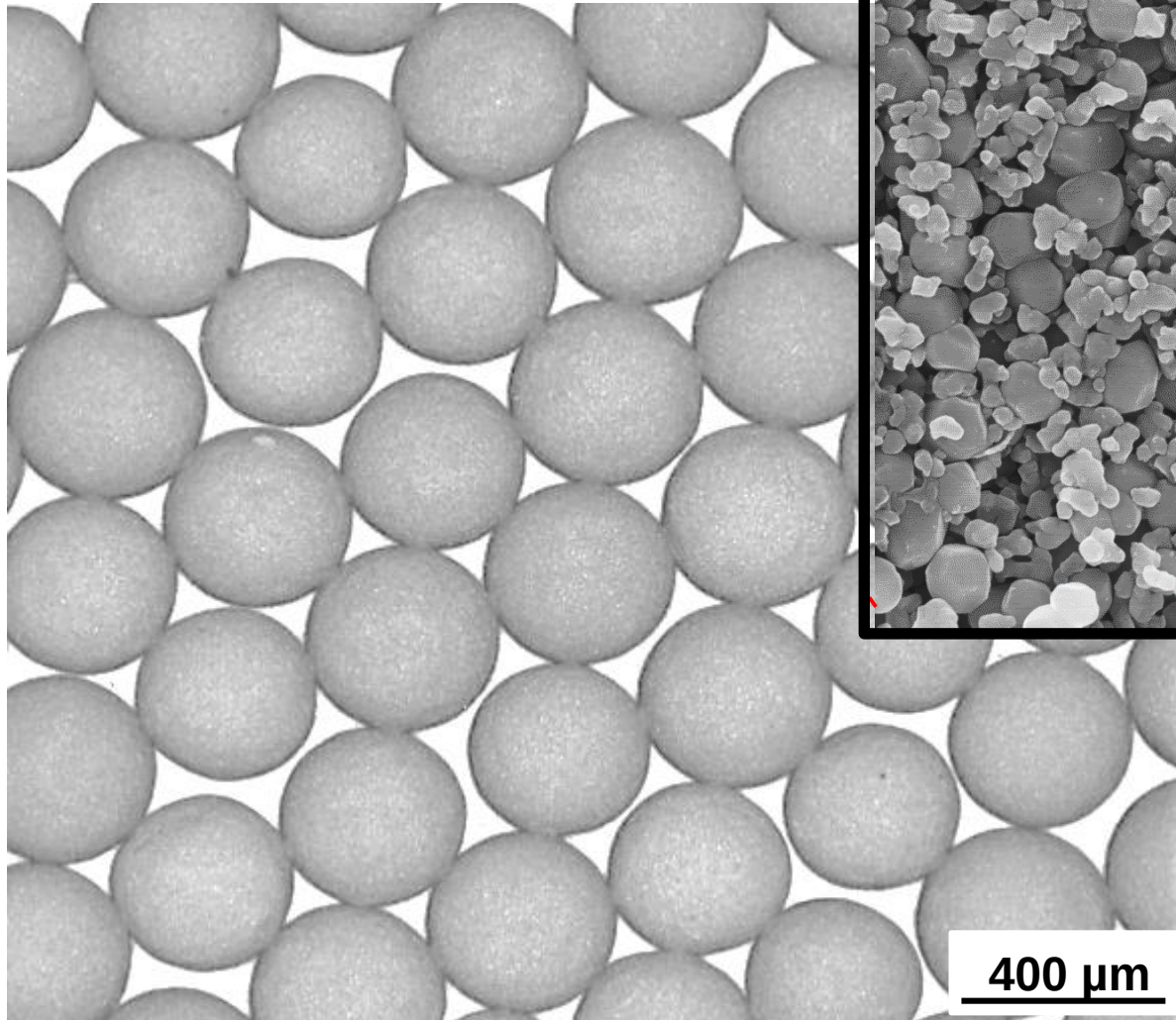


Poly(sodium 4-styrenesulfonate)

複合粒子の開発



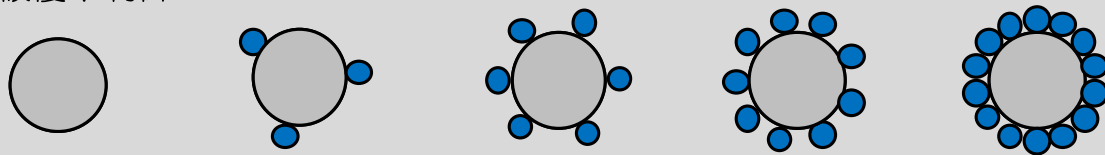
複合顆粒の開発



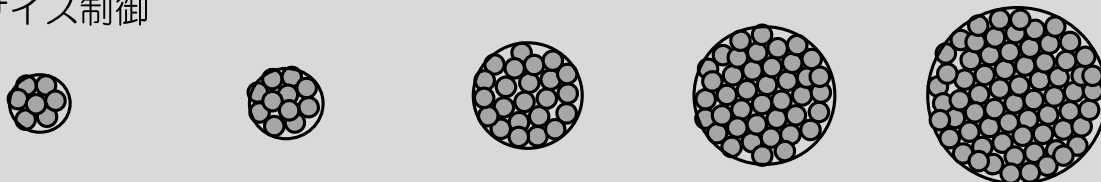
- 真球状
- 単分散

次世代モノづくりのための粒子設計

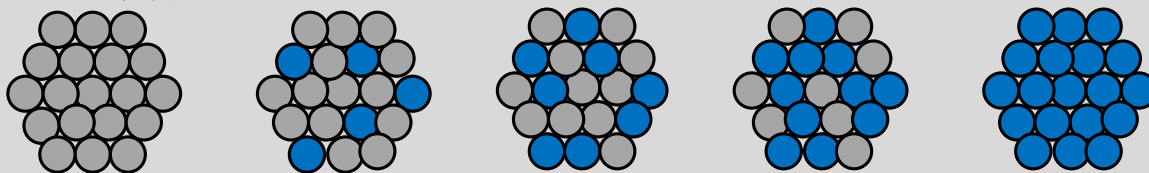
(a): 被覆率制御



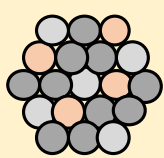
(b): サイズ制御



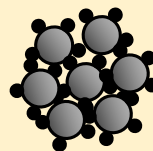
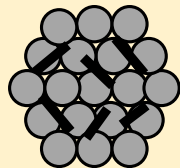
(c): 組成制御



(d):



(d)-1: 多元系



(d)-2: 高次構造系



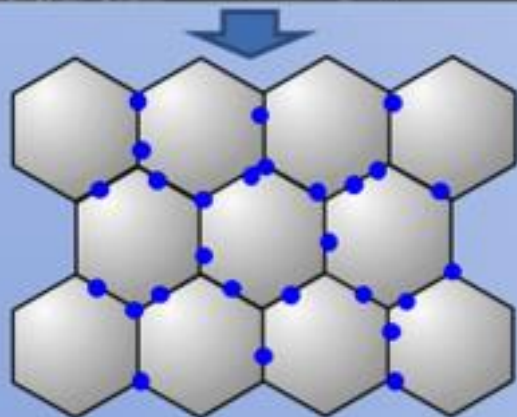
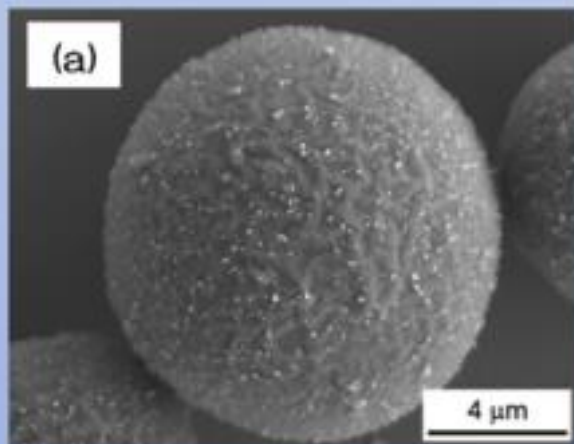
特殊材
3D造形

- 傾斜
- 内部構造



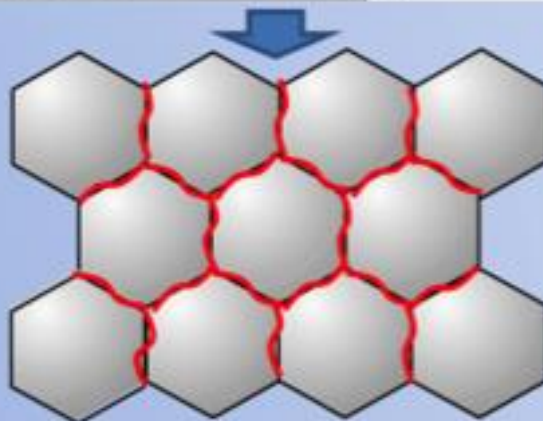
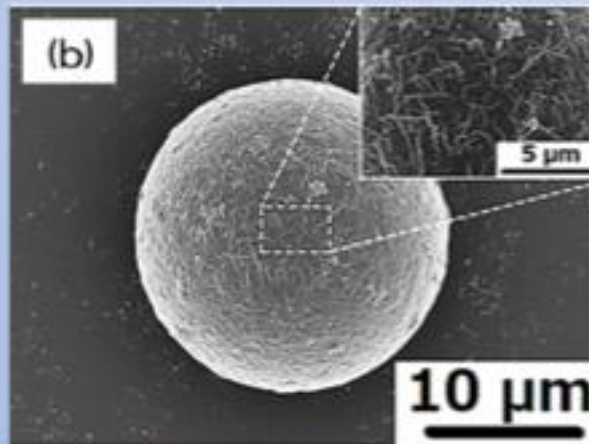
新規複合材料の開発

ナノ高分散型



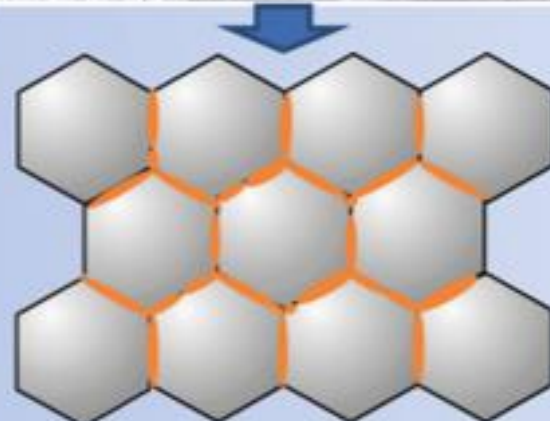
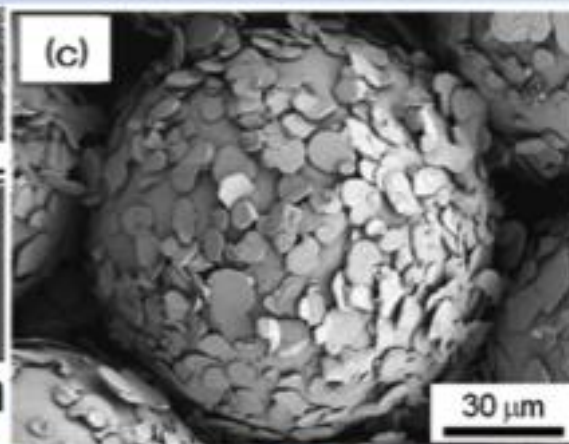
• 熱線吸収透明材料
ITO / PMMA

ナノパーコレーション型



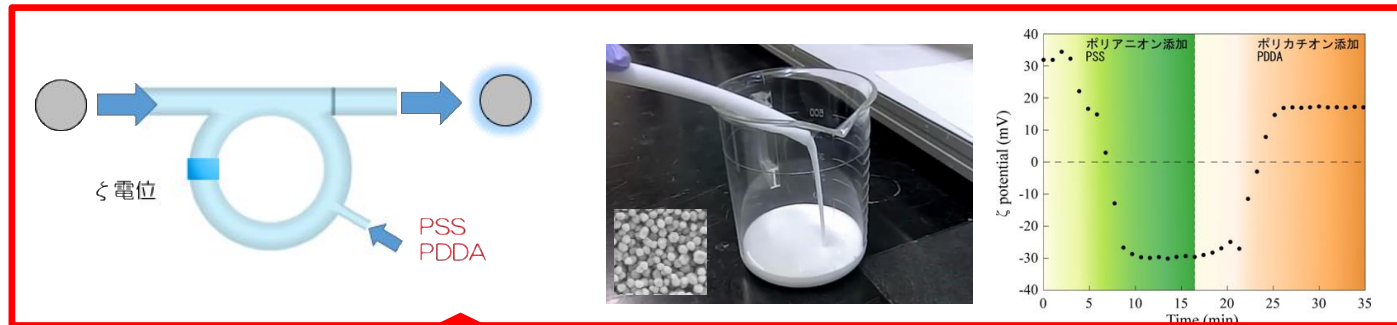
• 透明導電材料
CNT / PMMA

ナノ連結型

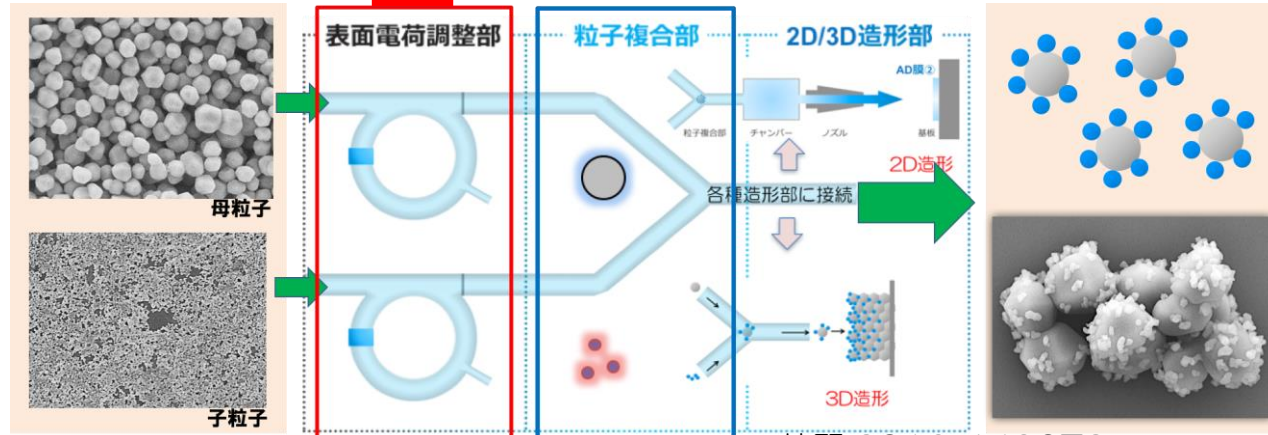


• 高熱伝導材料
BN / PMMA

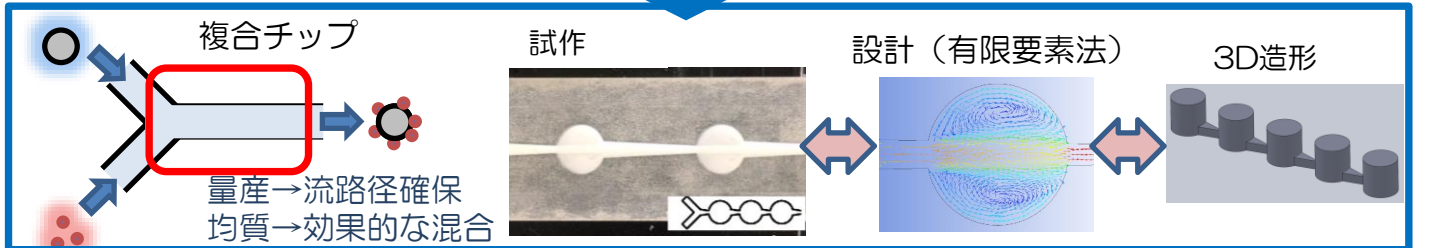
複合粒子製造システムの開発



電荷付与部



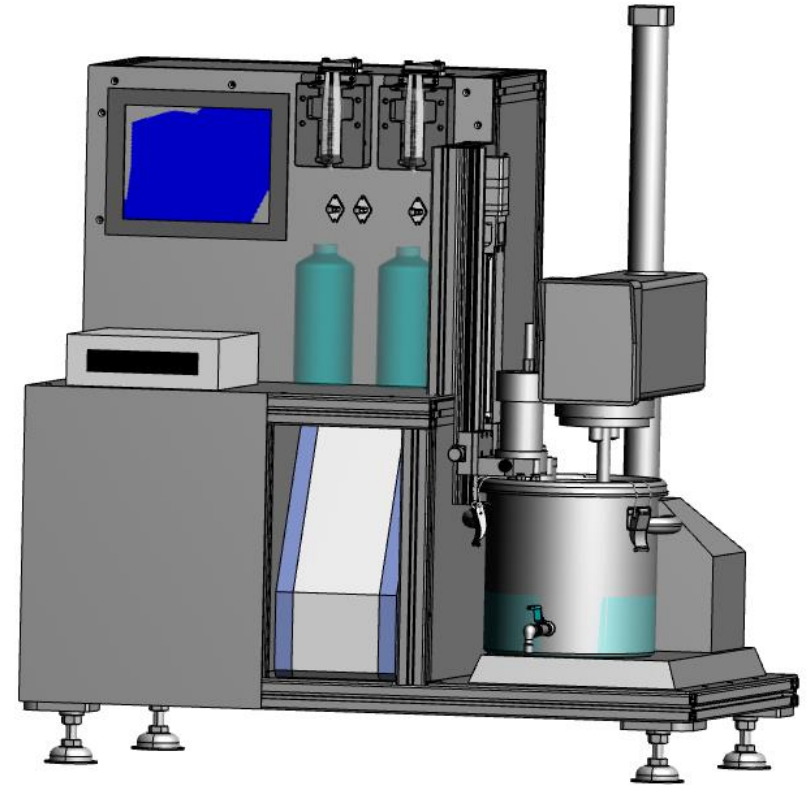
粒子複合部



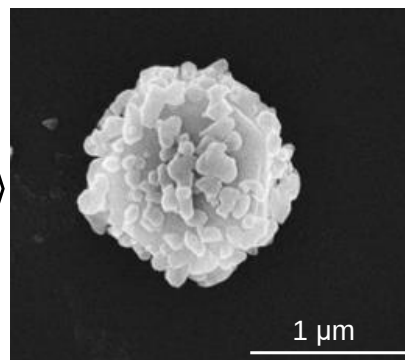
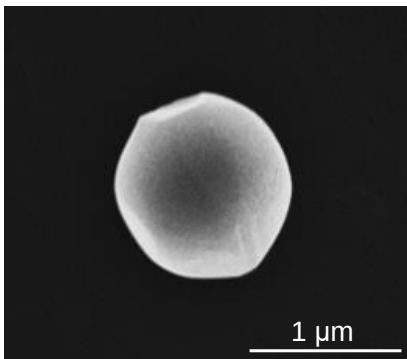
特願 2016-149072

複合粒子製造装置および複合粒子製造方法

自動表面電荷調整装置

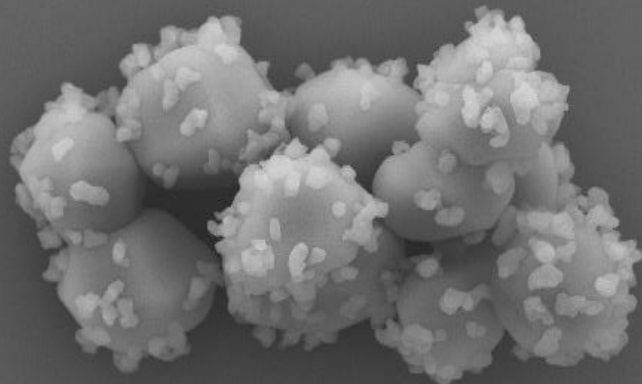
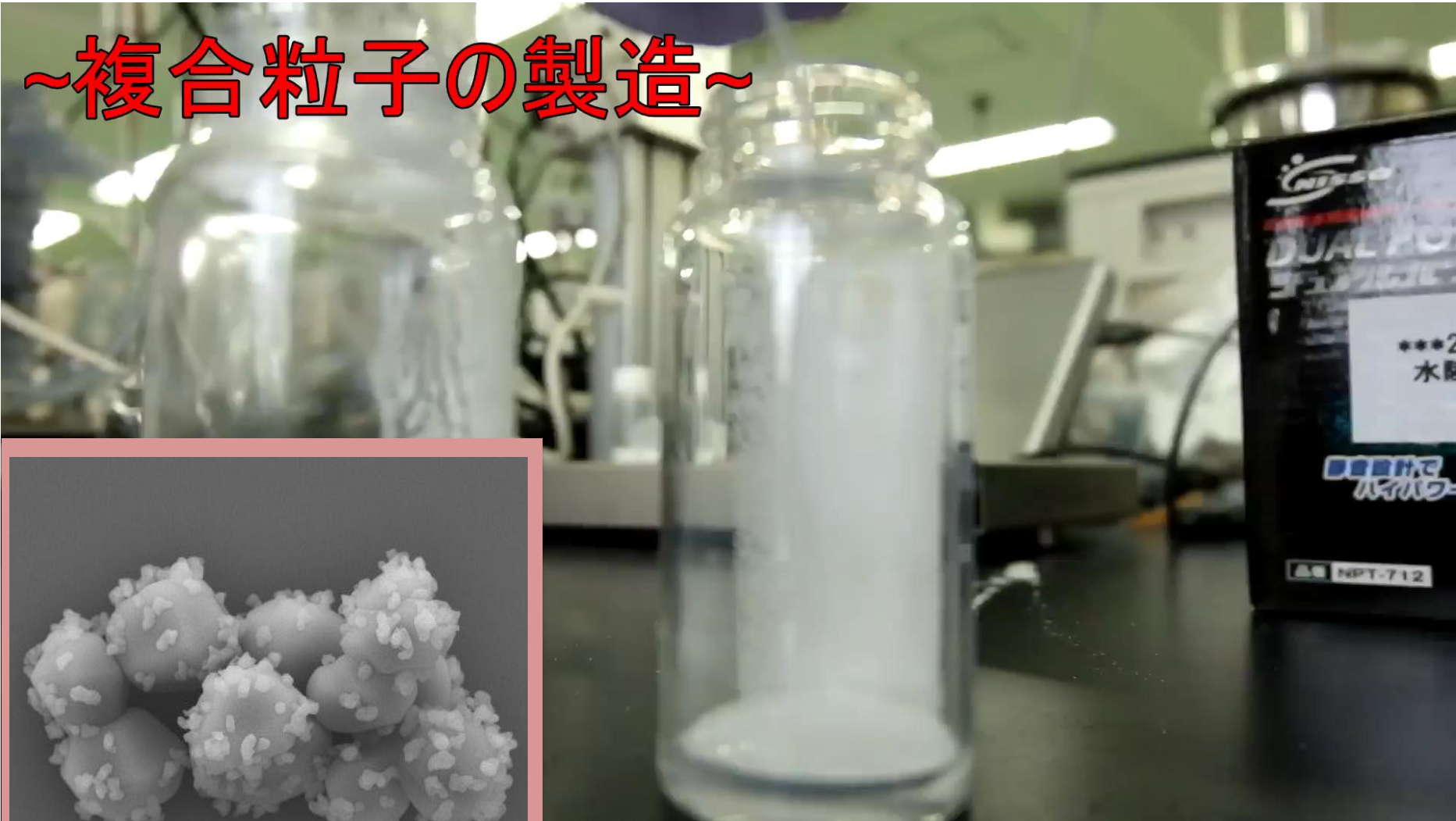


- ・ テストユース :
岐阜セラミックス研究所
- ・ 販売 :
A社 (2019. 4~)



複合粒子製造システムの開発

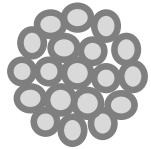
~複合粒子の製造~



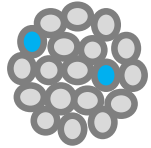
アルミナ系複合粒子が連続的に製造できています

次世代モノづくり（傾斜材料の設計）

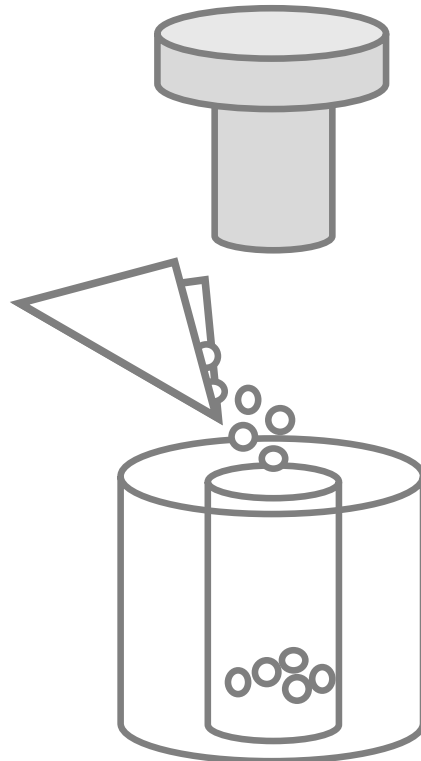
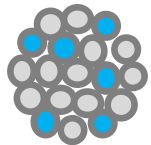
Composite granule



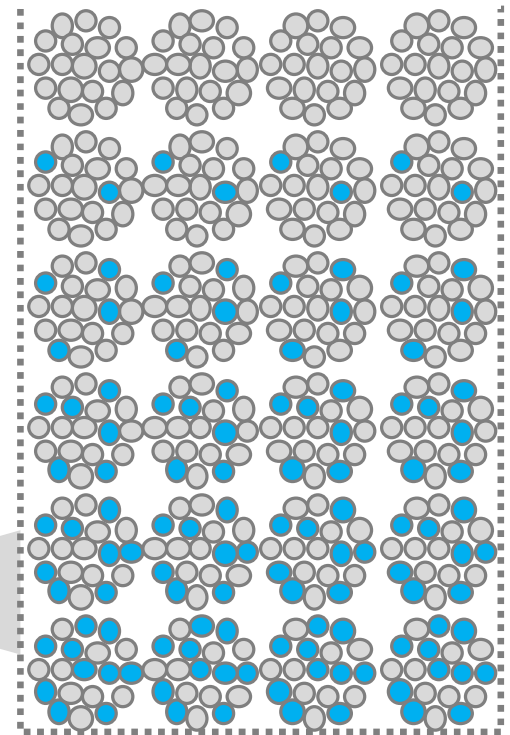
○ A



● B

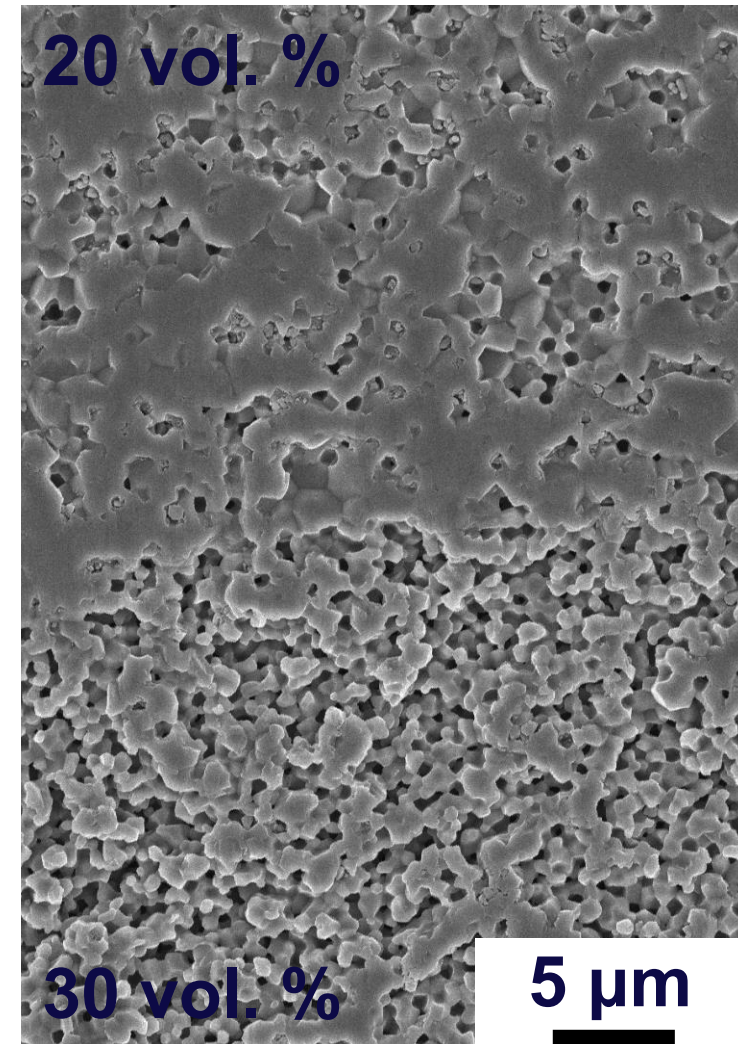
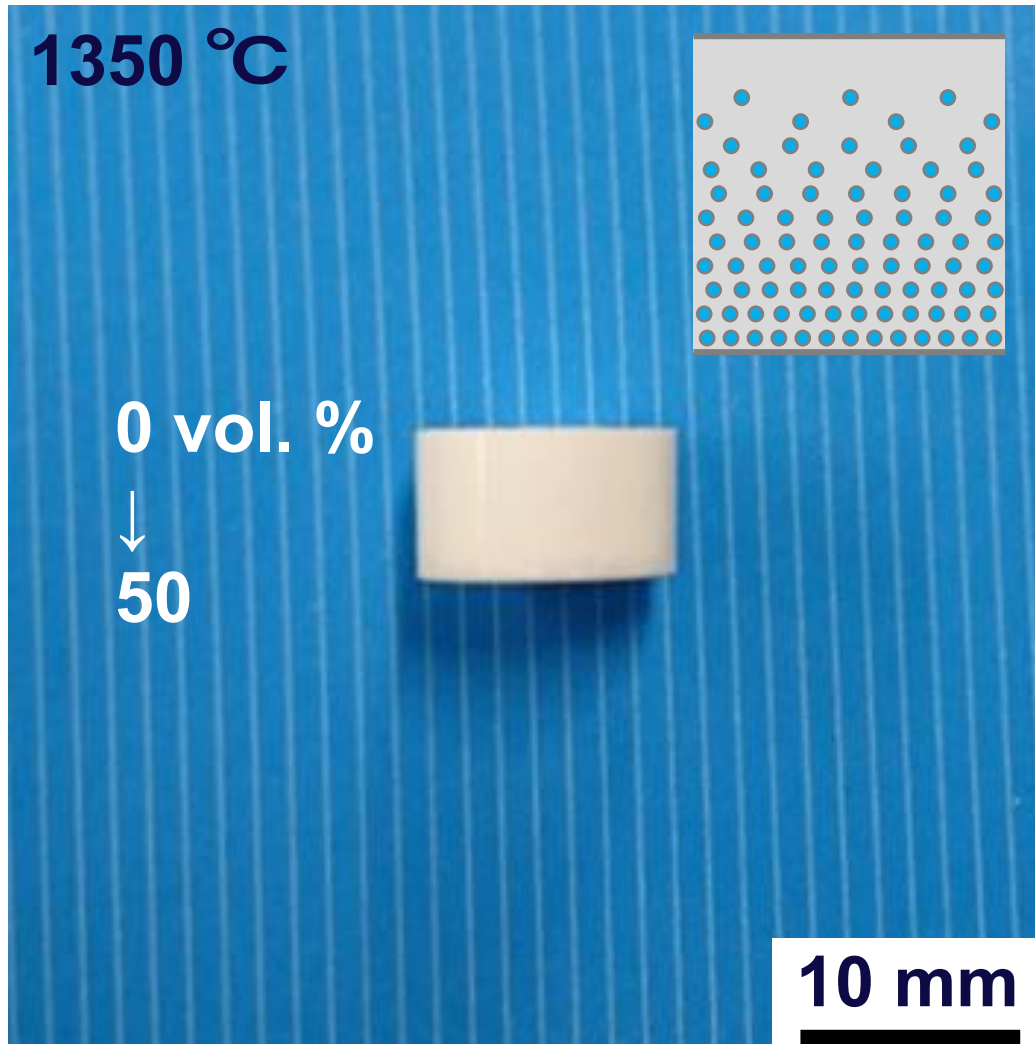


Press



次世代モノづくり（傾斜多孔質材料）

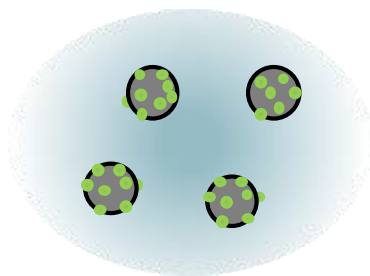
傾斜多孔質アルミナの開発



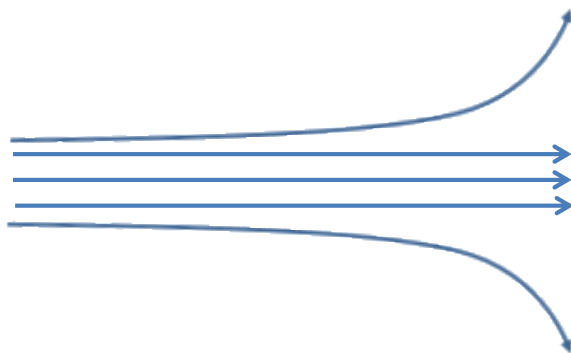
次世代モノづくり (AD複合膜)

ナノ粒子高分散透明セラミックス複合膜の開発

セラミックス
粒子
+
・ 金属酸化物
・ ナノカーボン



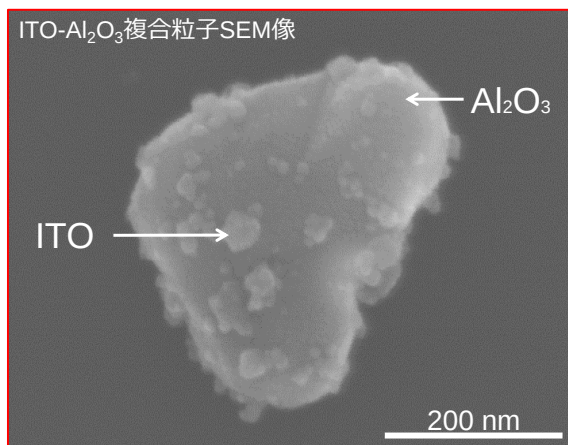
複合粒子



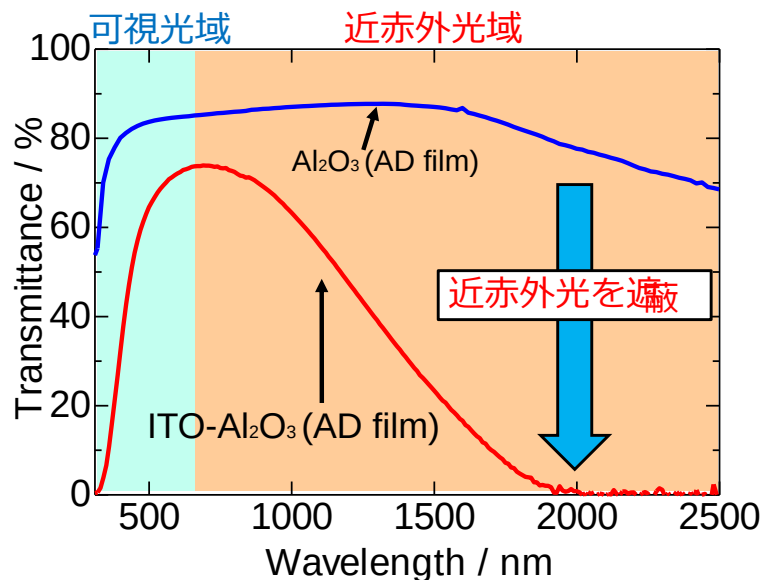
機械特性
電気特性
磁気特性
熱特性
光学特性



光学特性制御

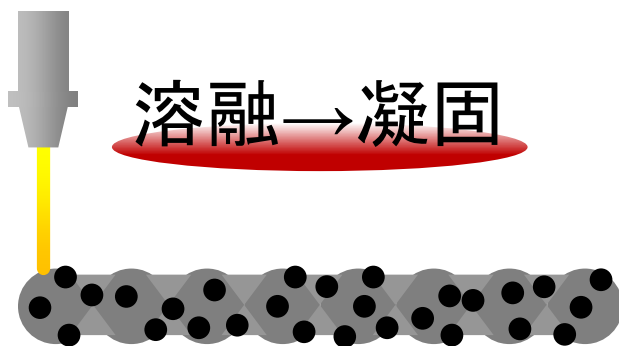


ITO:近赤外線吸収物質



次世代モノづくり（3D造形）

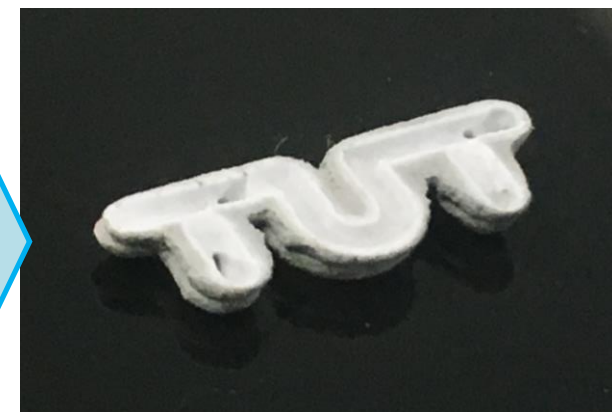
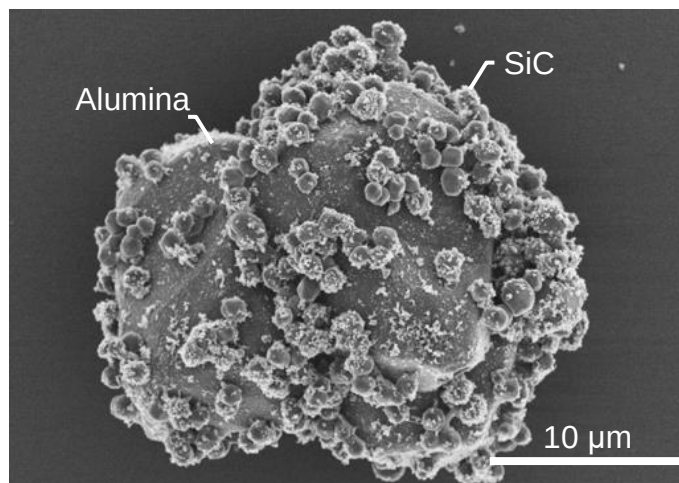
セラミック材料の直接造形



[セラミック材料]

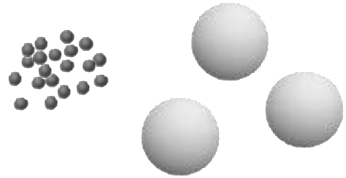
- ・融解温度 **高**
- ・レーザ吸収率 **低→高**

⇒ 造形 **困難→可能**



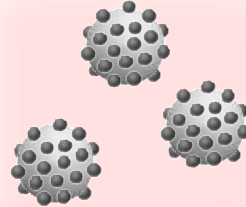
アルミナの直接造形

まとめ



原料粉末

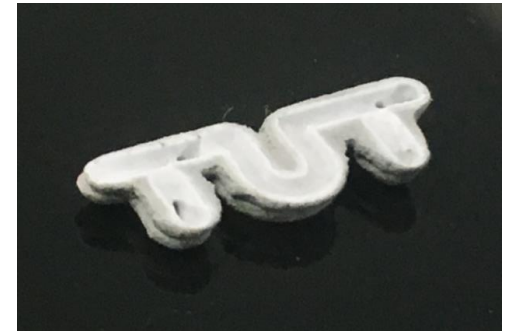
静電吸着



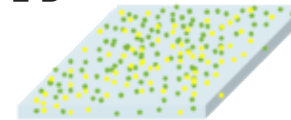
複合粒子

次世代材料

3 D



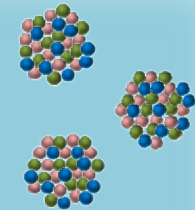
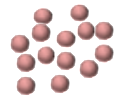
2 D



composite



静電集積



複合顆粒

