

# SUMIDIA Binderless

M39 to M41

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Binderless

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Binderless

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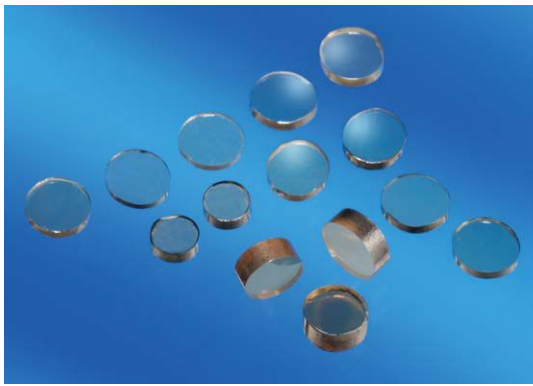
SUMIDIA  
Binderless

 Nano-Polycrystalline Diamond Tool / SUMIDIA Binderless ...M40

 MOLD FINISH MASTER / SUMIDIA Binderless Ball-nose Endmills NPDB Type...M41

M39

# SUMIDIA Binderless



## General Features

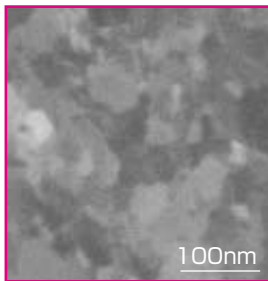
SUMIDIA Binderless is polycrystalline diamond that directly binds nano-order diamond particles with high strength without using any binders. SUMIDIA Binderless is harder than single-crystal diamond and has no cleavability. Therefore, it enables machining of hard, brittle material such as carbides and makes possible new machining methods.

## Characteristic

- SUMIDIA Binderless is a pure diamond, but, unlike single-crystal diamonds, has no anisotropy. Therefore, it displays excellent wear resistance with less uneven wear.
- Thanks to its polycrystalline structure, SUMIDIA Binderless has no cleavability peculiar to single-crystal diamonds and displays excellent fracture resistance.

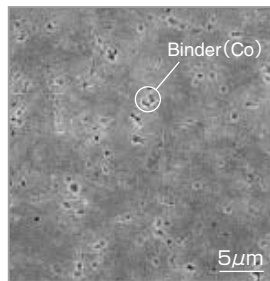
## Comparison of Structures

SUMIDIA Binderless  
SEM Image



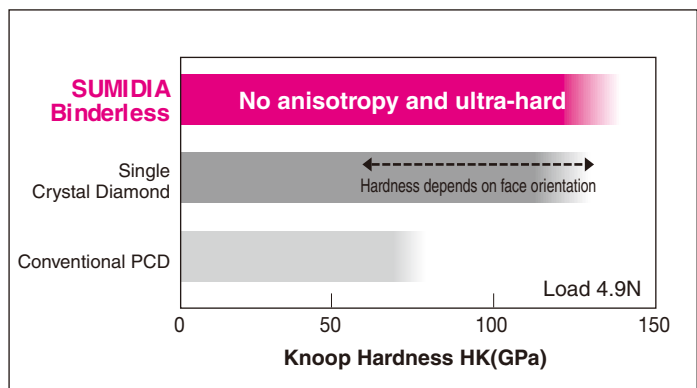
Diamond Grains  
(30 to 50nm)

Conventional PCD  
SEM Image



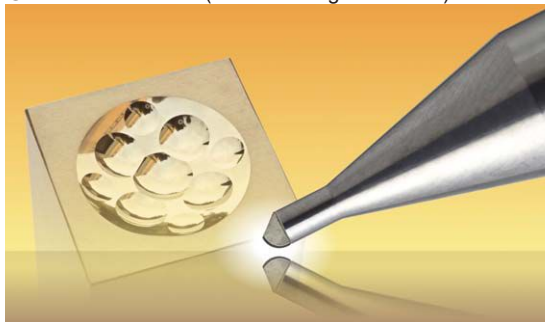
Diamond Grains  
(1 to 10µm)

## Hardness



## Application Examples of SUMIDIA Binderless

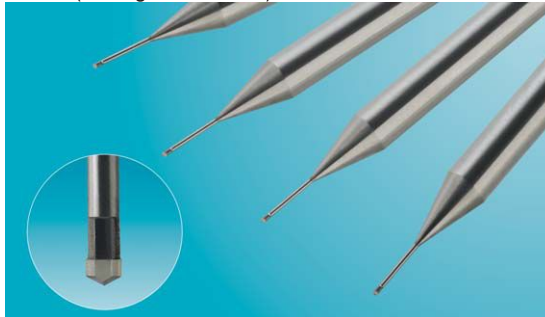
### Ballnose Endmill (Direct Cutting of Carbide)



### Indexable Insert (Turning of Carbide)



### Drill (Drilling of Ceramics)



### Cutting Tool (Ultra-Precision Cutting of Carbide)





NPDB Type Stock Page 

## ■ General Features

The NPDB type enables direct mirror finishing of carbide, which is impossible for existing single-crystal or polycrystalline diamonds, by employing nanopolycrystalline diamond, which is harder than single-crystal diamond, for the cutting edge.

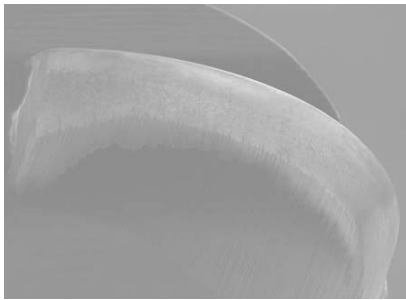
## ■ Characteristic

### ● Ideal for Finishing of Hard, Brittle Materials Including Carbide

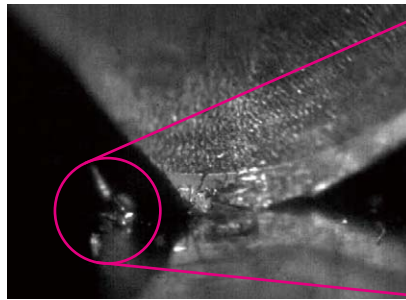
Provides excellent machined surface quality thanks to the sharp cutting edge and optimized edge treatment.

### ● Enables High-Precision Machining and Achieves Long Tool Life

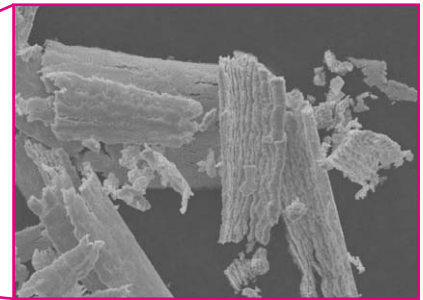
Maintains excellent dimensional accuracy for a long time thanks to the high contour accuracy of the cutting edge and the excellent wear resistance of diamonds.



Close-up of Cutting Edge


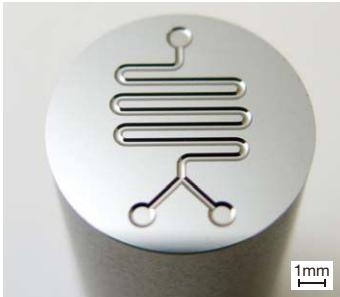


Direct Cutting of Carbide



Chip (Close-up)

## ■ Application Example

Application to Optical Use (Fly-Eye Lens Mold)	Application to Medical Use ( $\mu$ -TAS Mold)
	
<p>Work Material : Carbide AF1 (Ultra-fine Grain Carbide)                      Finishing Tool : SUMIDIA Binderless R0.5 Ballnose Endmill (Finishing)                      (Roughing: R0.5 Diamond-Coated Endmill, 55 minutes)                      Finishing Time : 2 hours 40 minutes                      Finishing Conditions : <math>n = 60,000 \text{ min}^{-1}</math> <math>v_f = 300 \text{ mm/min}</math>  <math>p_f = 0.005 \text{ mm}</math> Oil Mist                      Surface Roughness : Ra0.015<math>\mu\text{m}</math></p>	<p>Work Material : Carbide AF1 (Ultra-fine Grain Carbide)                      Finishing Tool : SUMIDIA Binderless R0.3 Ballnose Endmill                      Finishing Time : 1 hour 28 minutes                      Finishing Conditions : <math>n = 38,000 \text{ min}^{-1}</math> <math>v_f = 95 \text{ mm/min}</math>                      Machining Allowance=0.003mm  <math>p_f = 0.001 \text{ mm}</math> Wet(Oil based) Cutting Length=8.3m                      Surface Roughness : Ra0.016 to 0.020<math>\mu\text{m}</math></p>