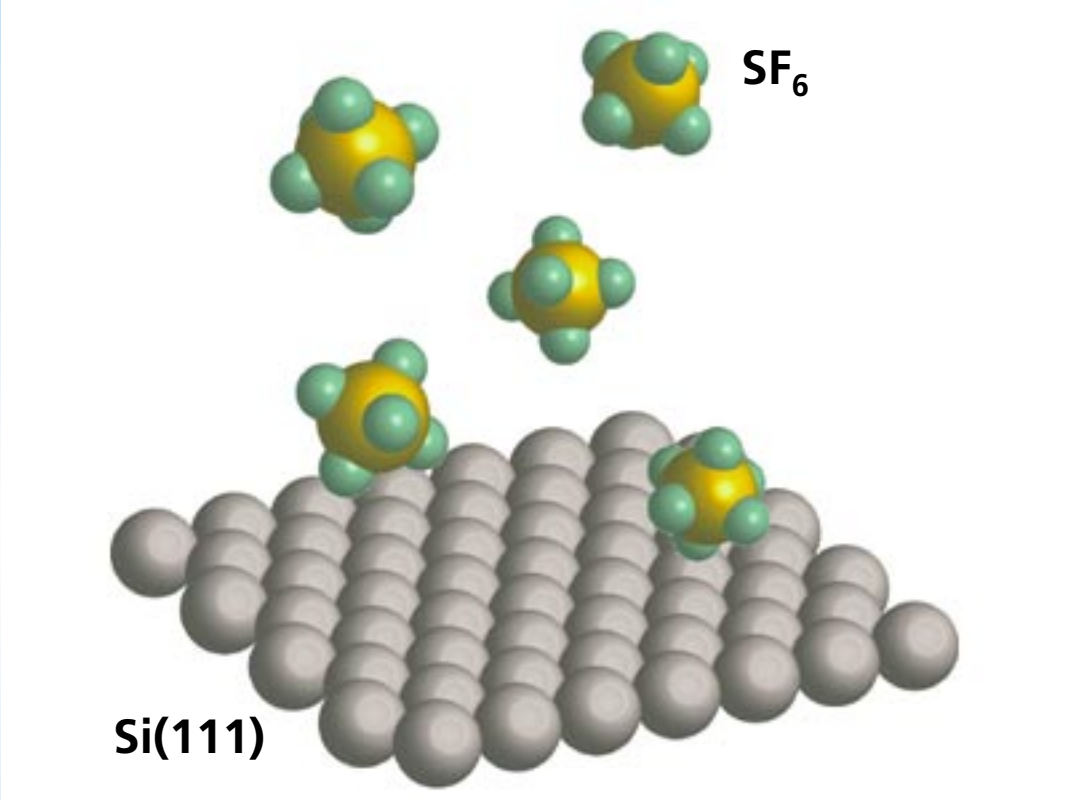
BLACK SILICON:
microstructuring silicon with femtosecond lasers

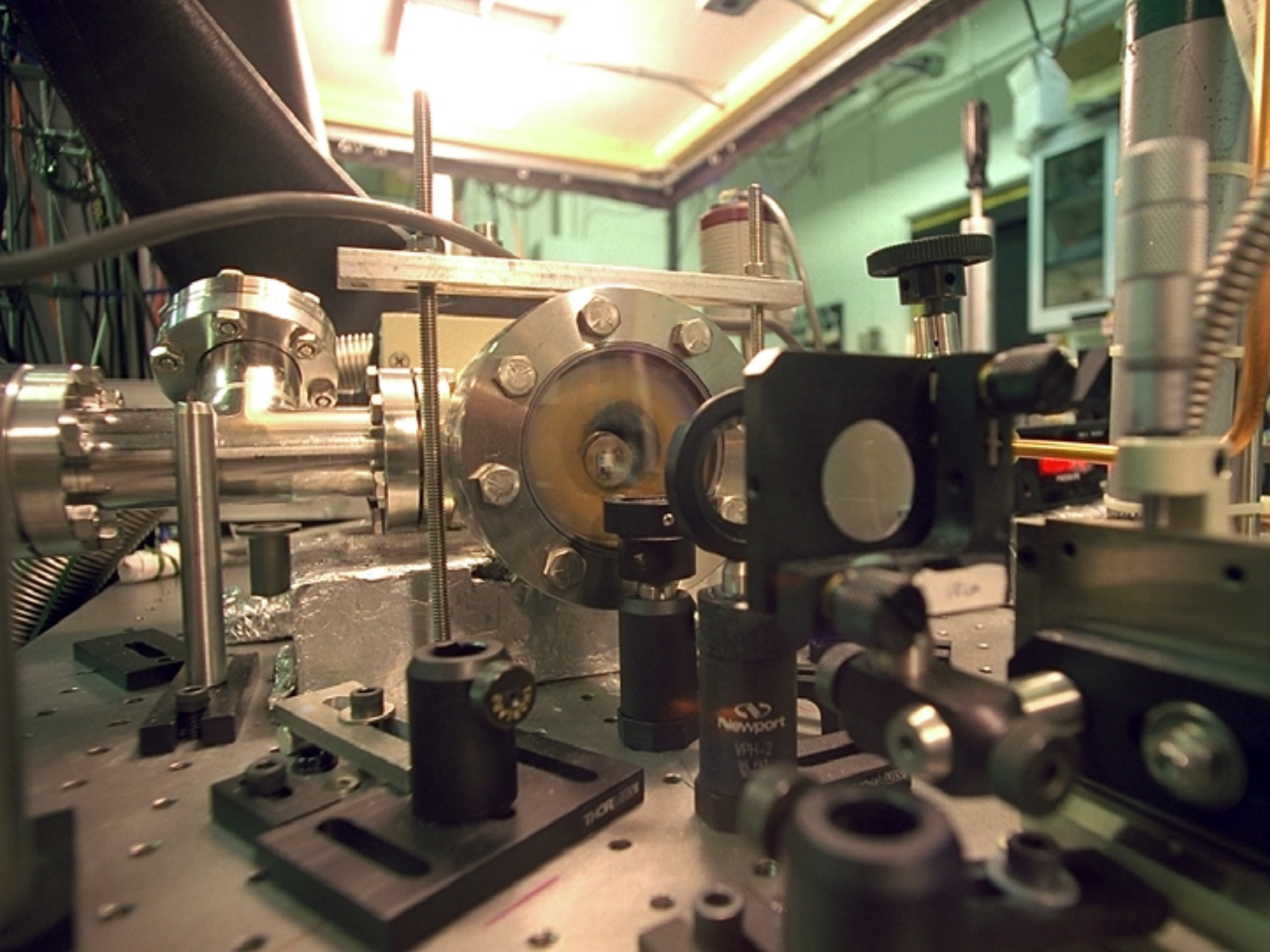
Tsing-Hua Her
Claudia Wu
Jim Carey
Catherine Crouch
Li Zhao
Eric Mazur

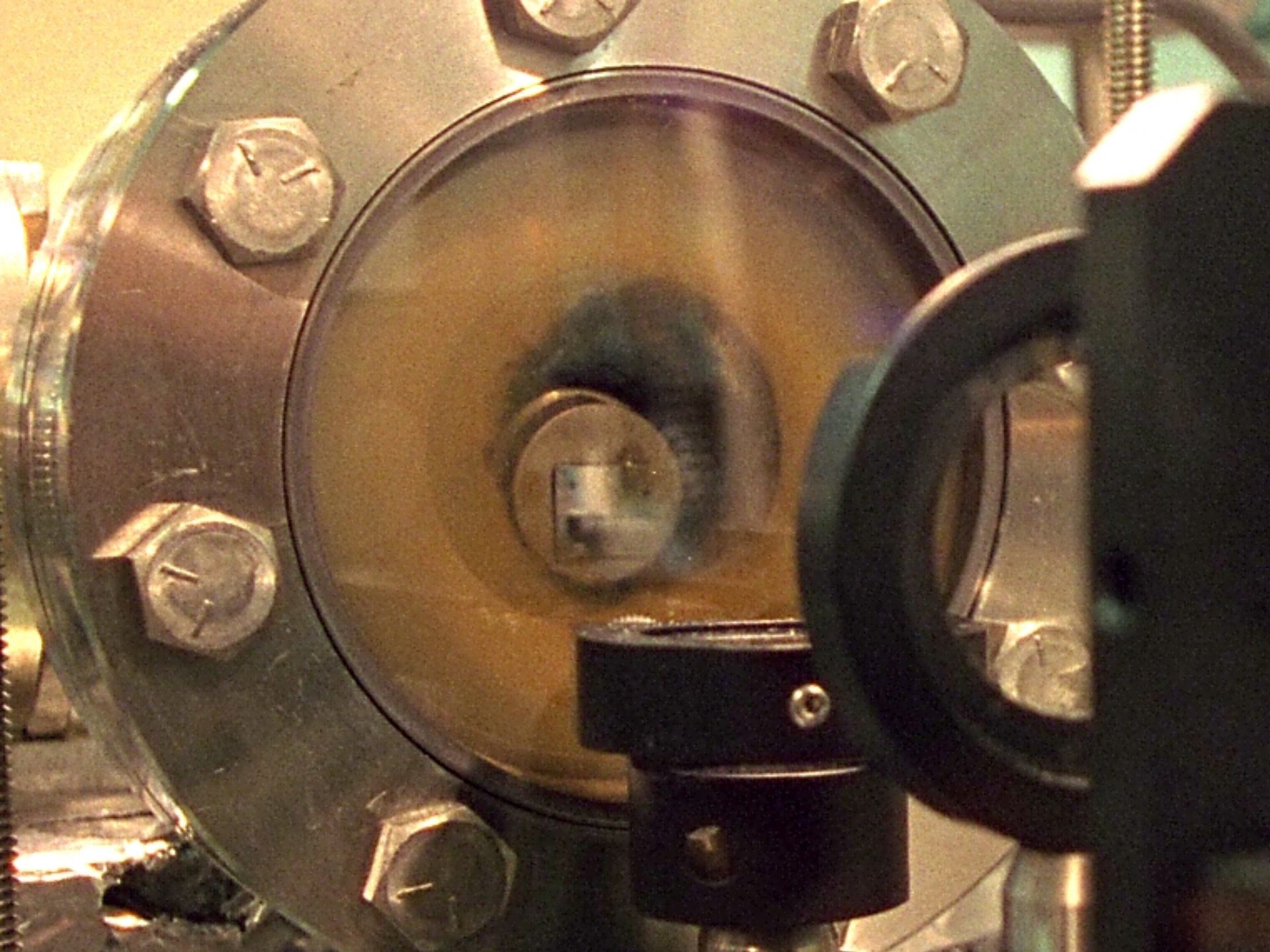
MRS Spring Meeting
San Francisco, 17 April 2001

Introduction

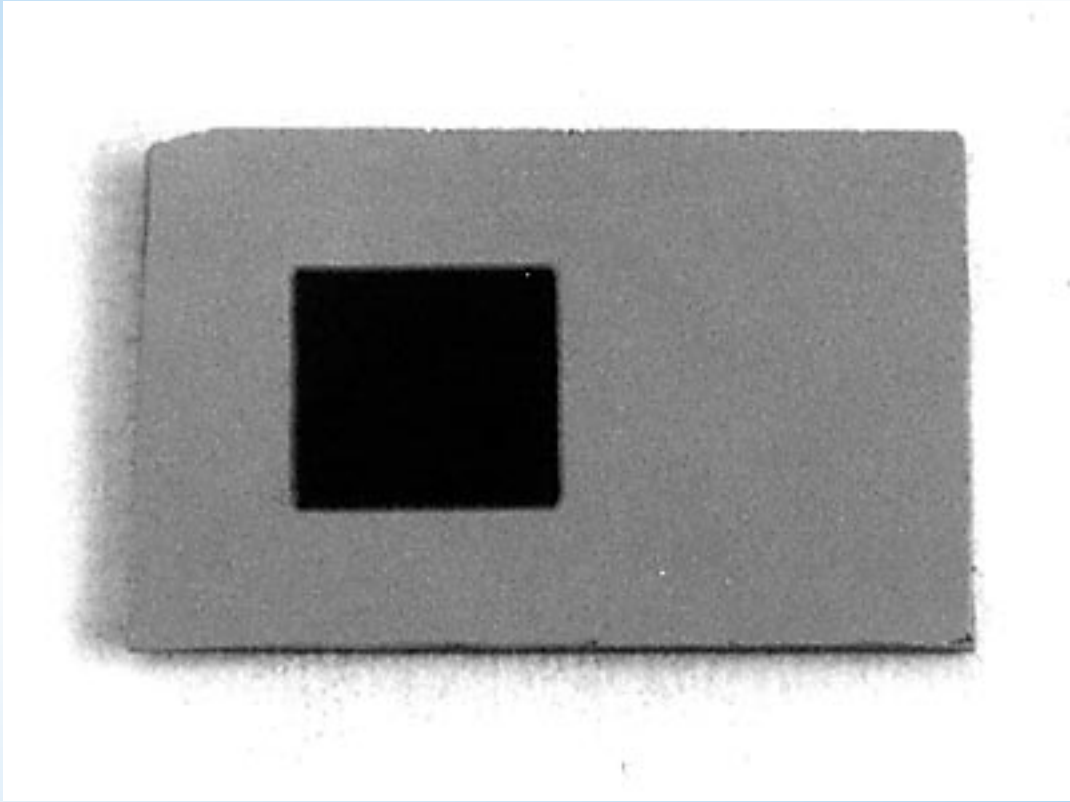


irradiate with 100 fs 10 kJ/m^2 laser pulses


Newport
VPH-2

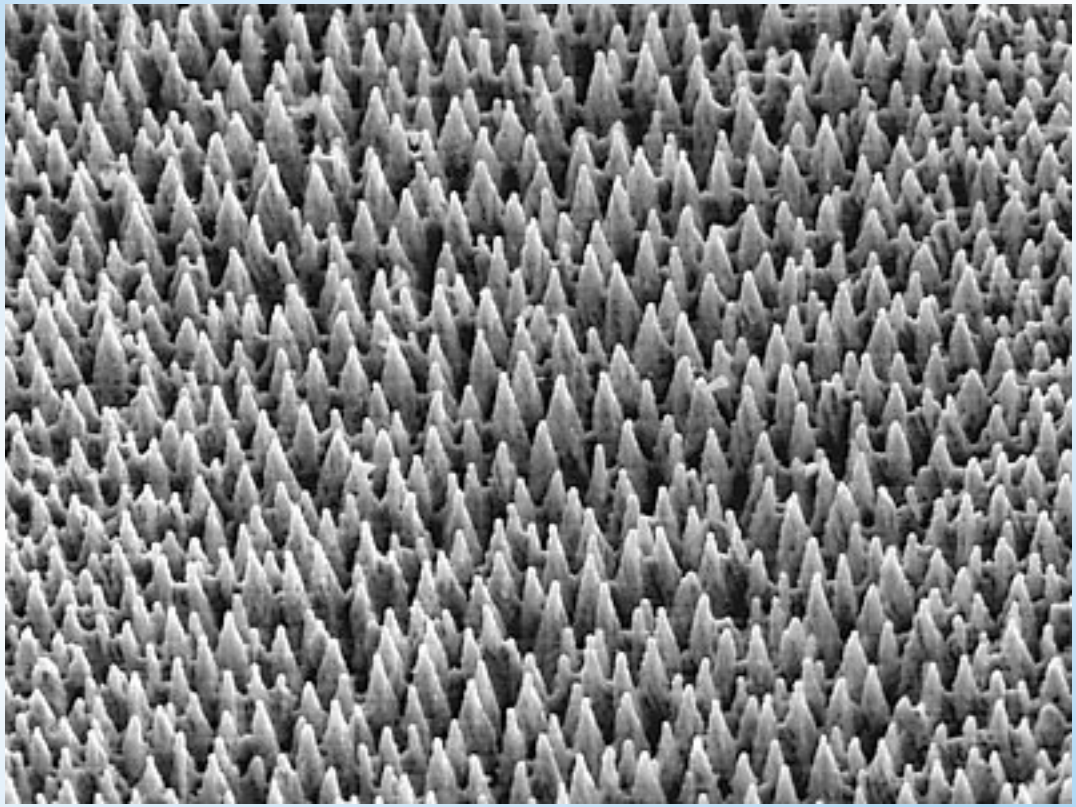


Introduction



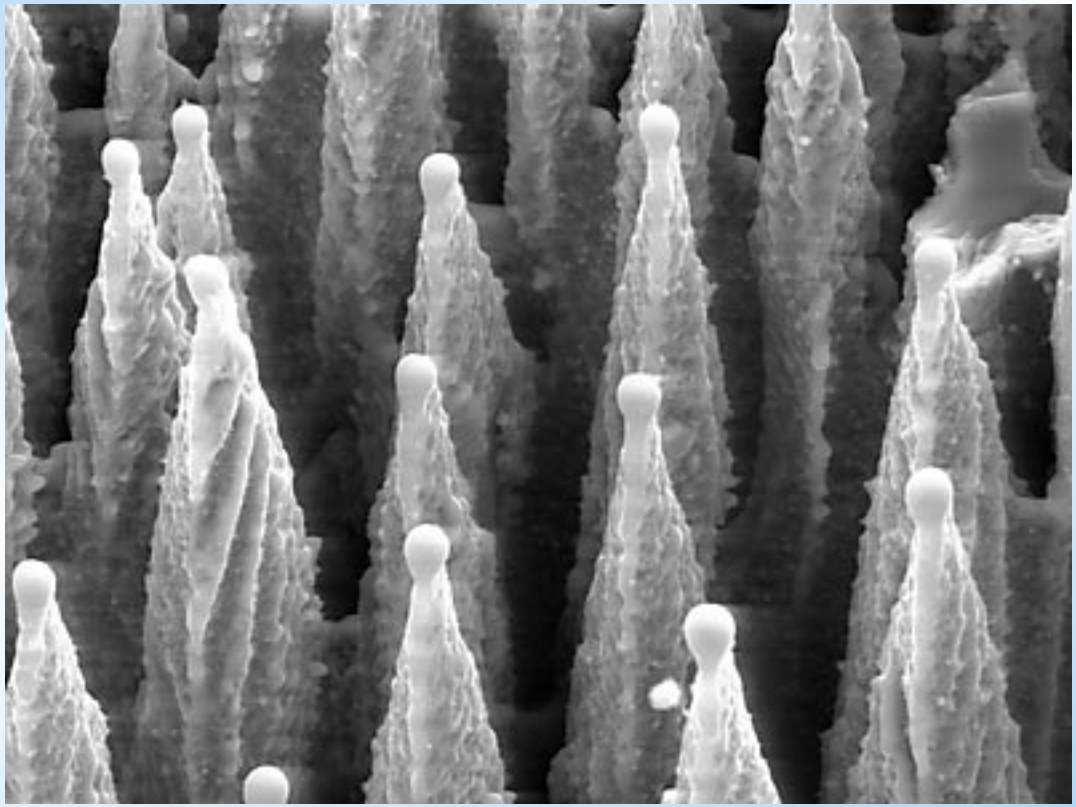
5 mm

Introduction

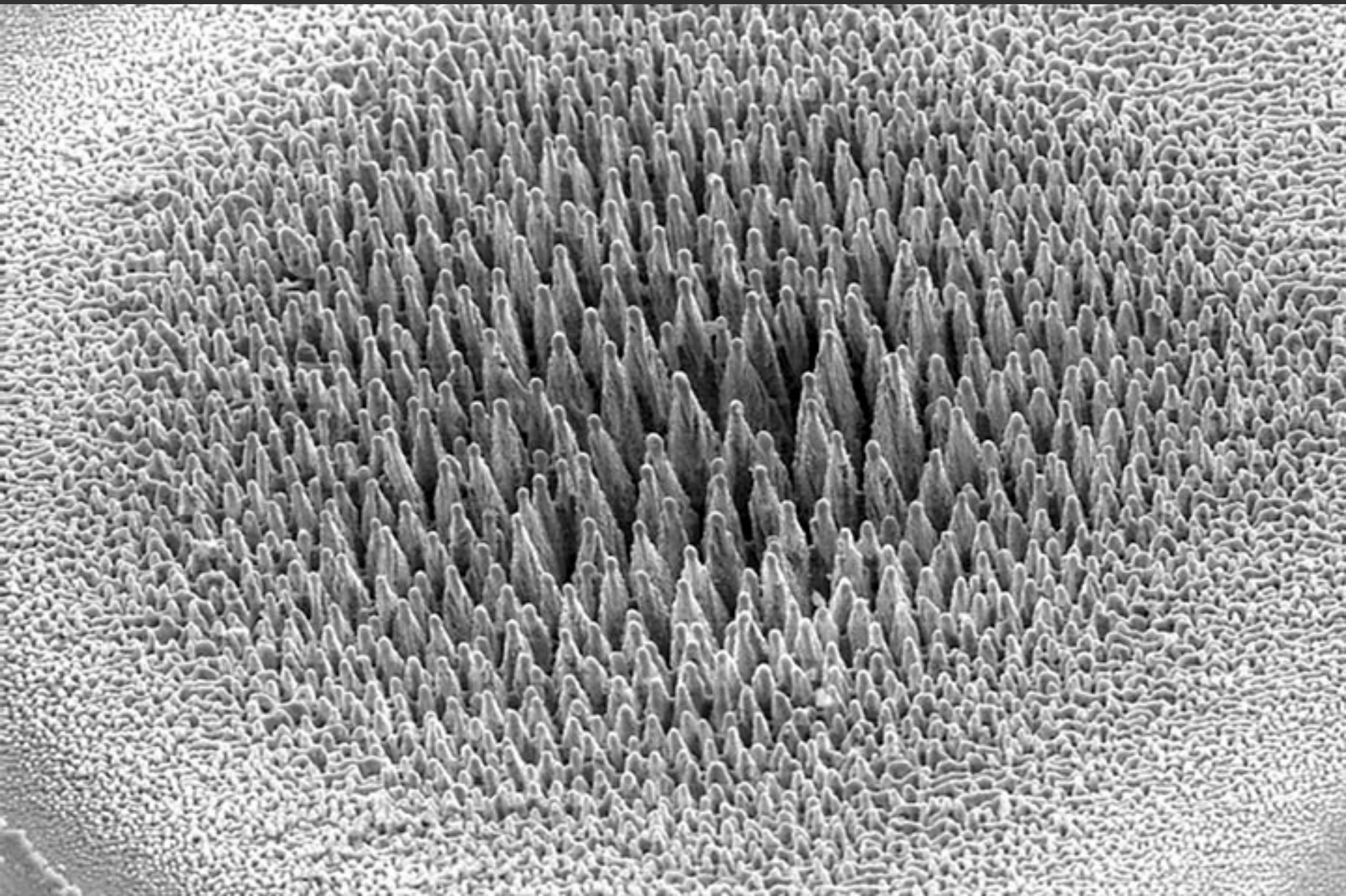


20 µm

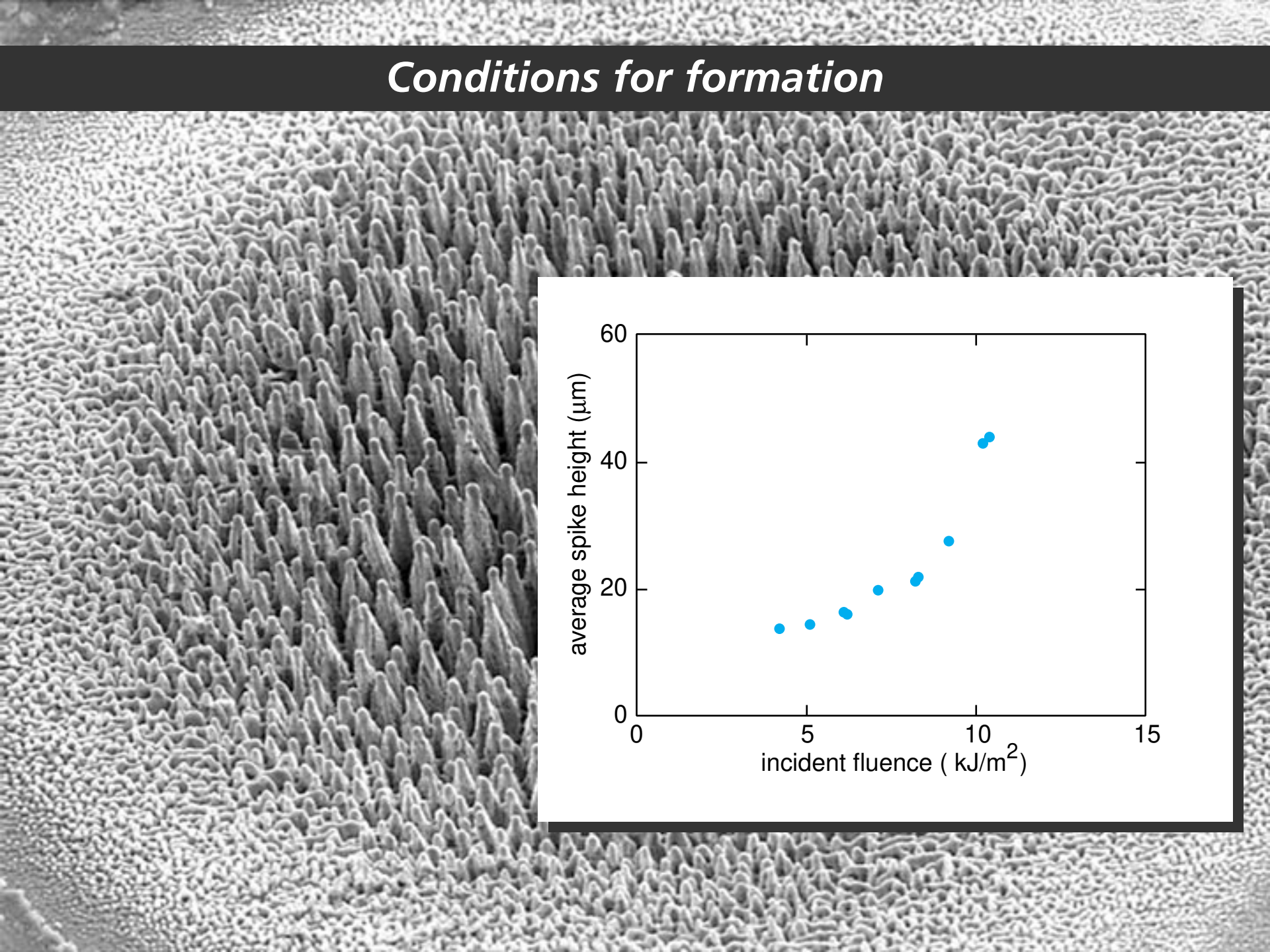
Introduction



Conditions for formation

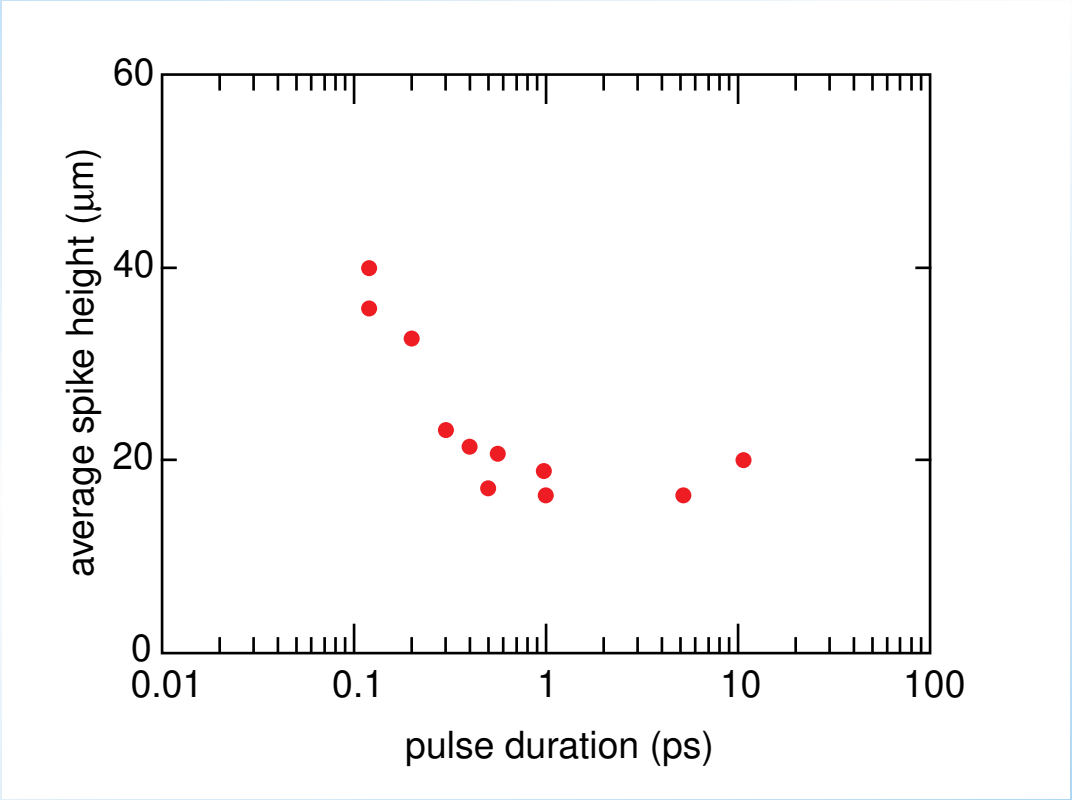


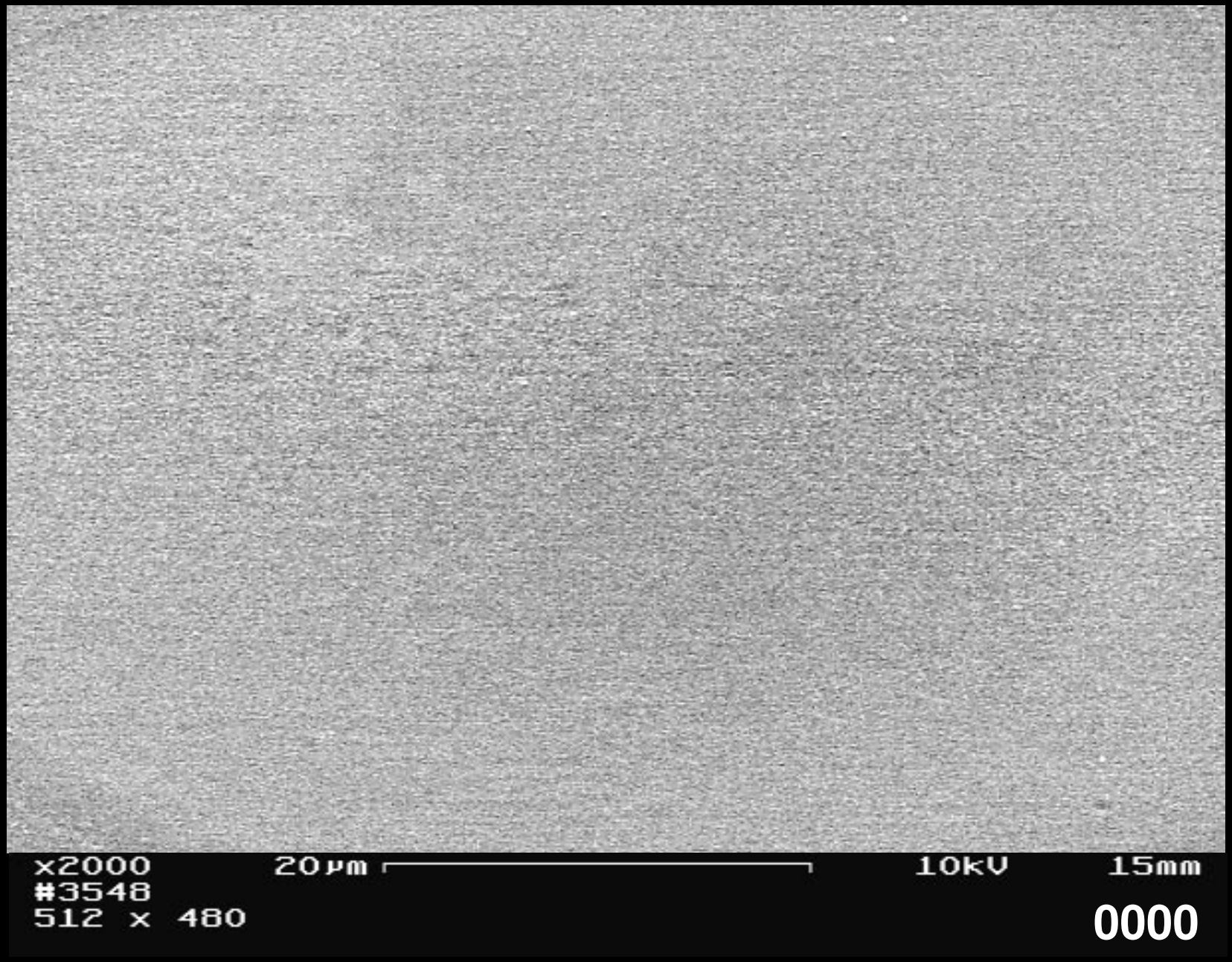
Conditions for formation



Conditions for formation

pulse duration dependence

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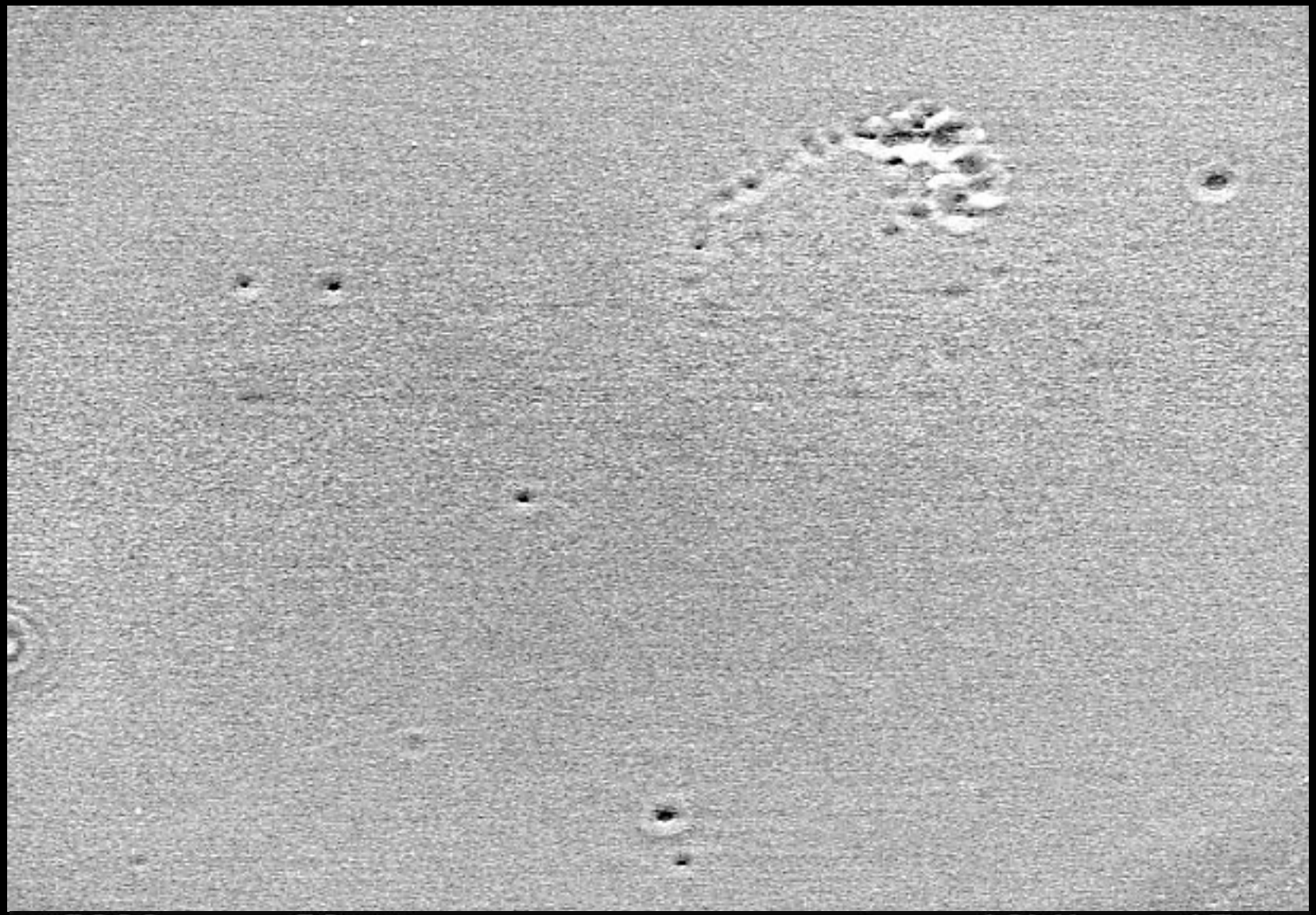
#3548
512 x 480
20µm
10kV
15mm
0000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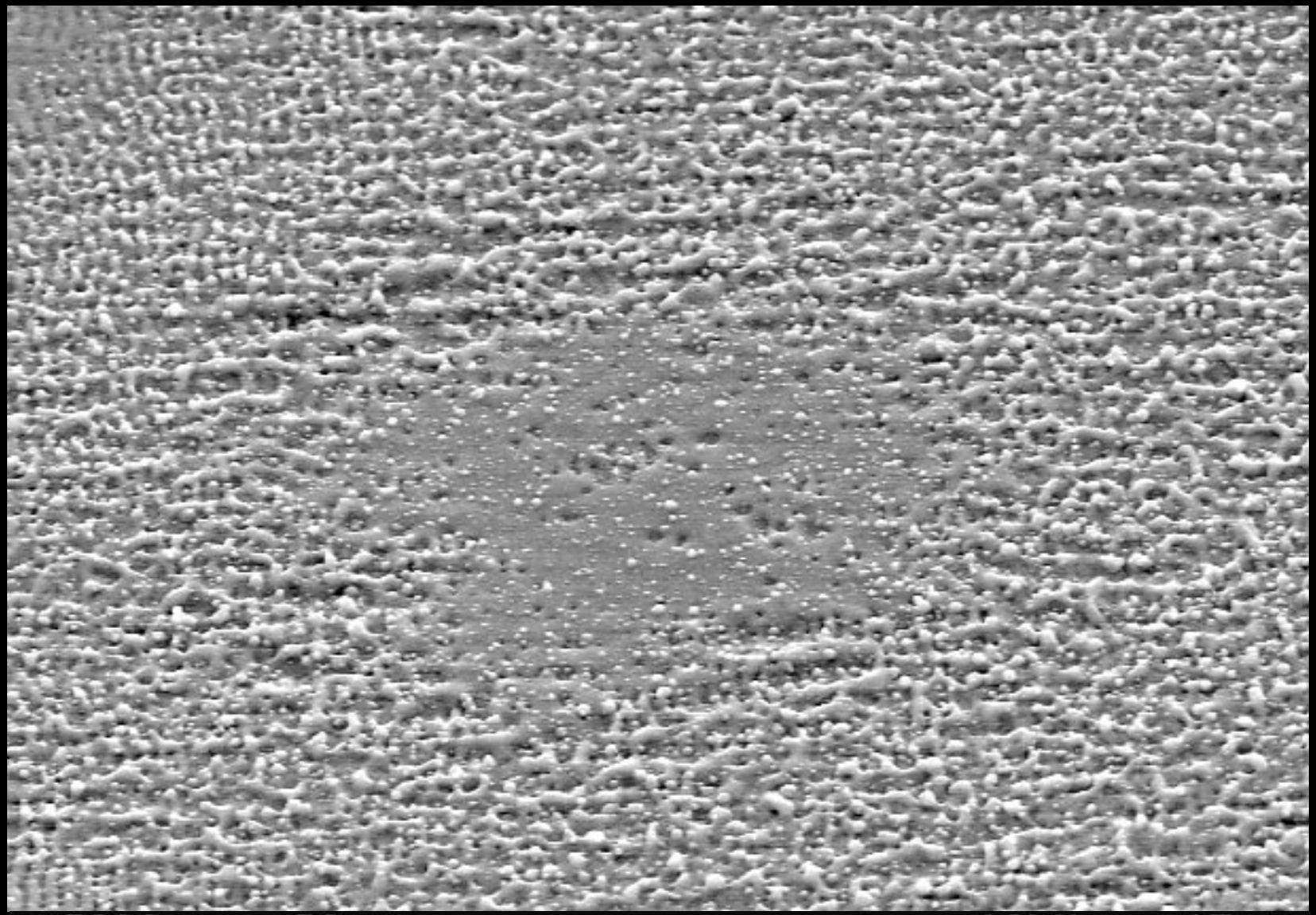
512 x 480
20µm
10kV
15mm
0001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10kV
15mm
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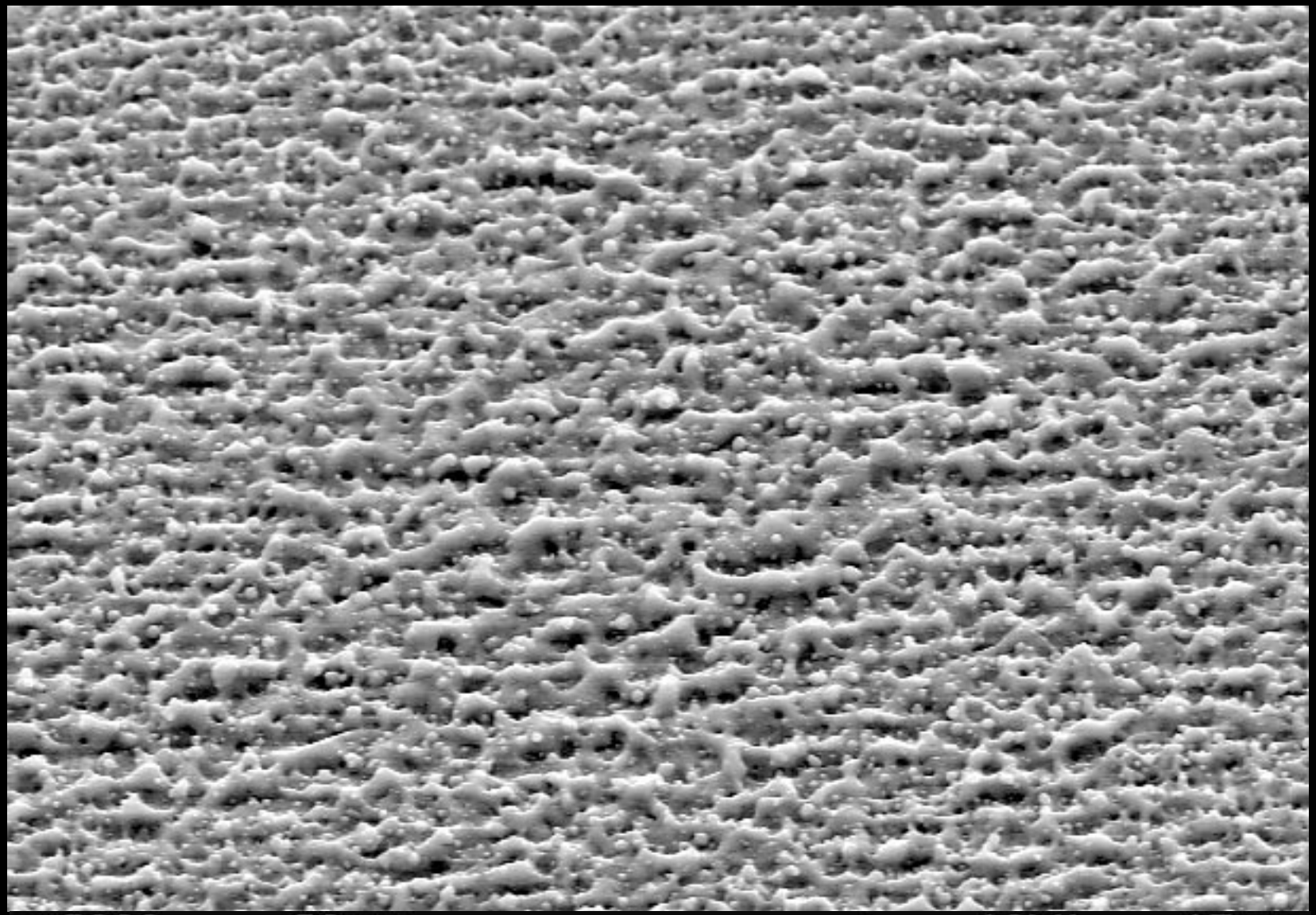
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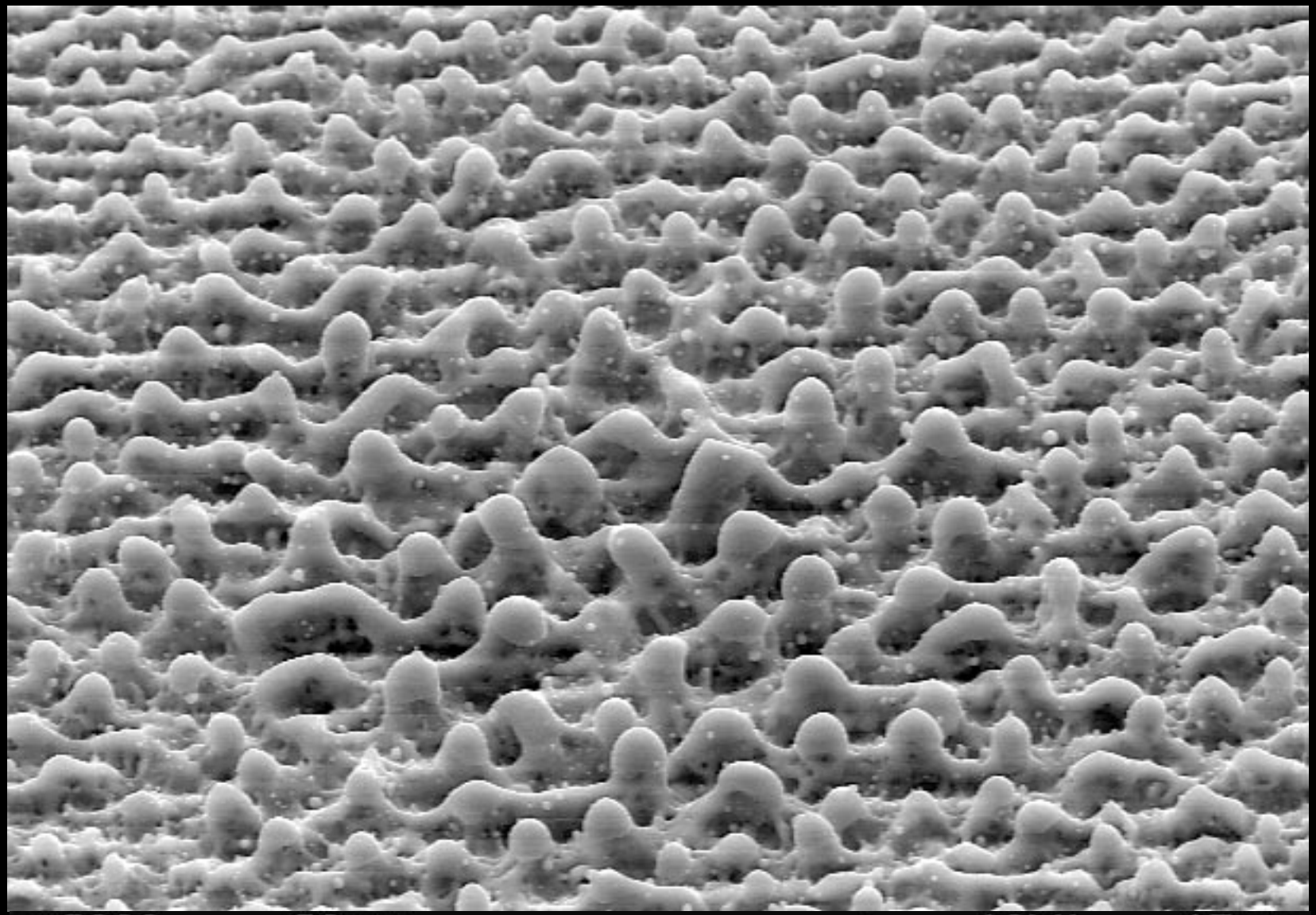
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10kV
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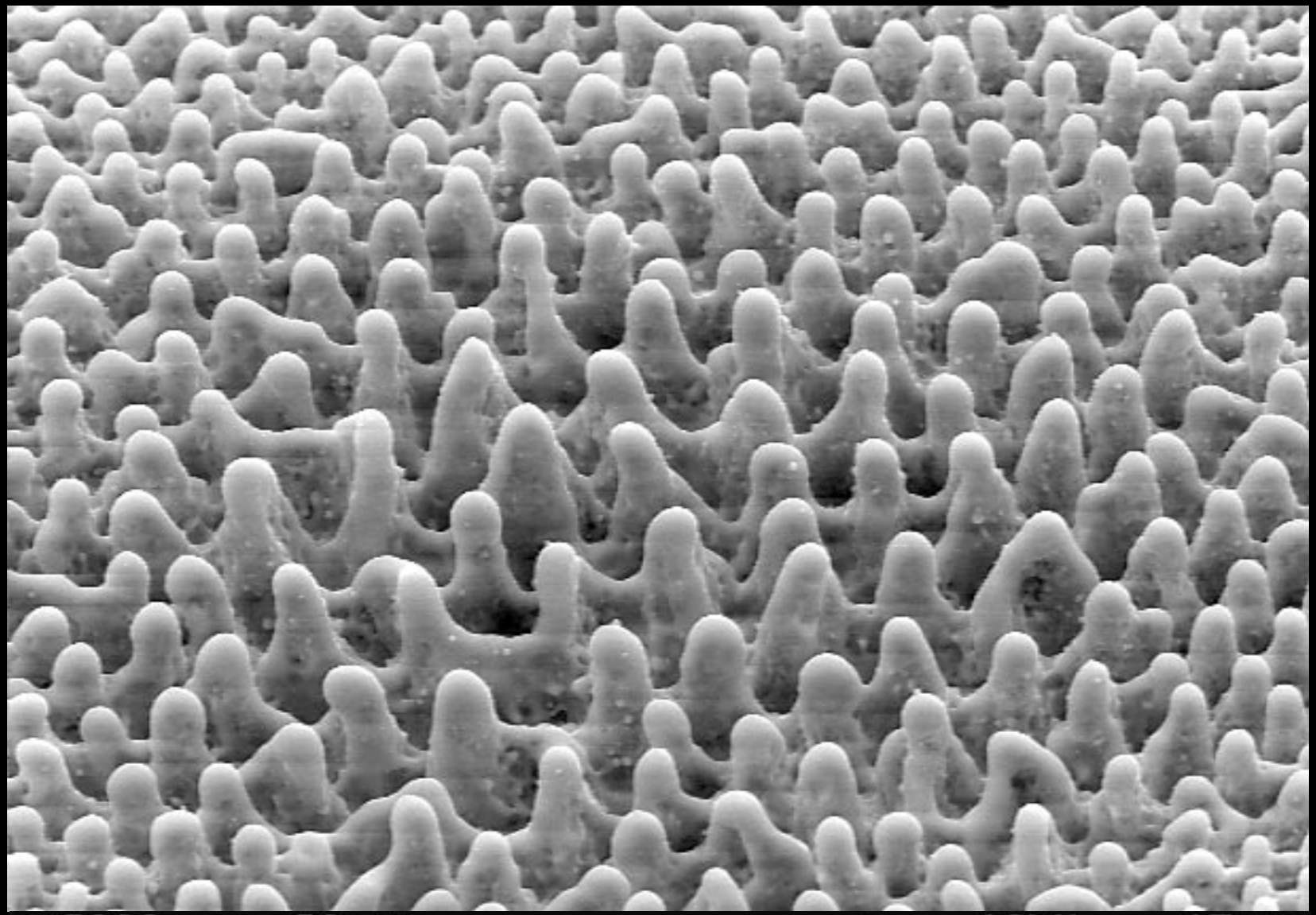
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10kV
15mm
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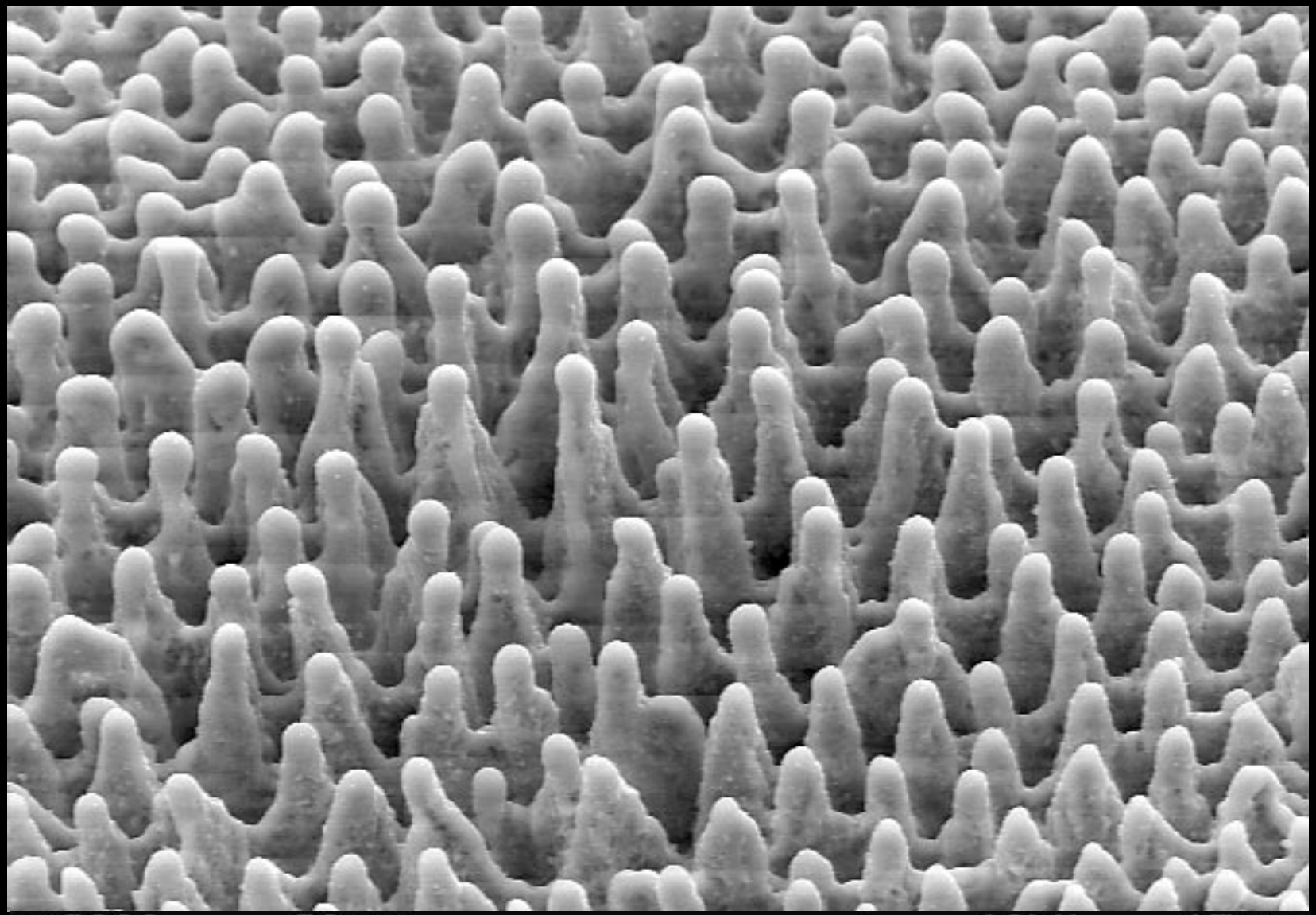
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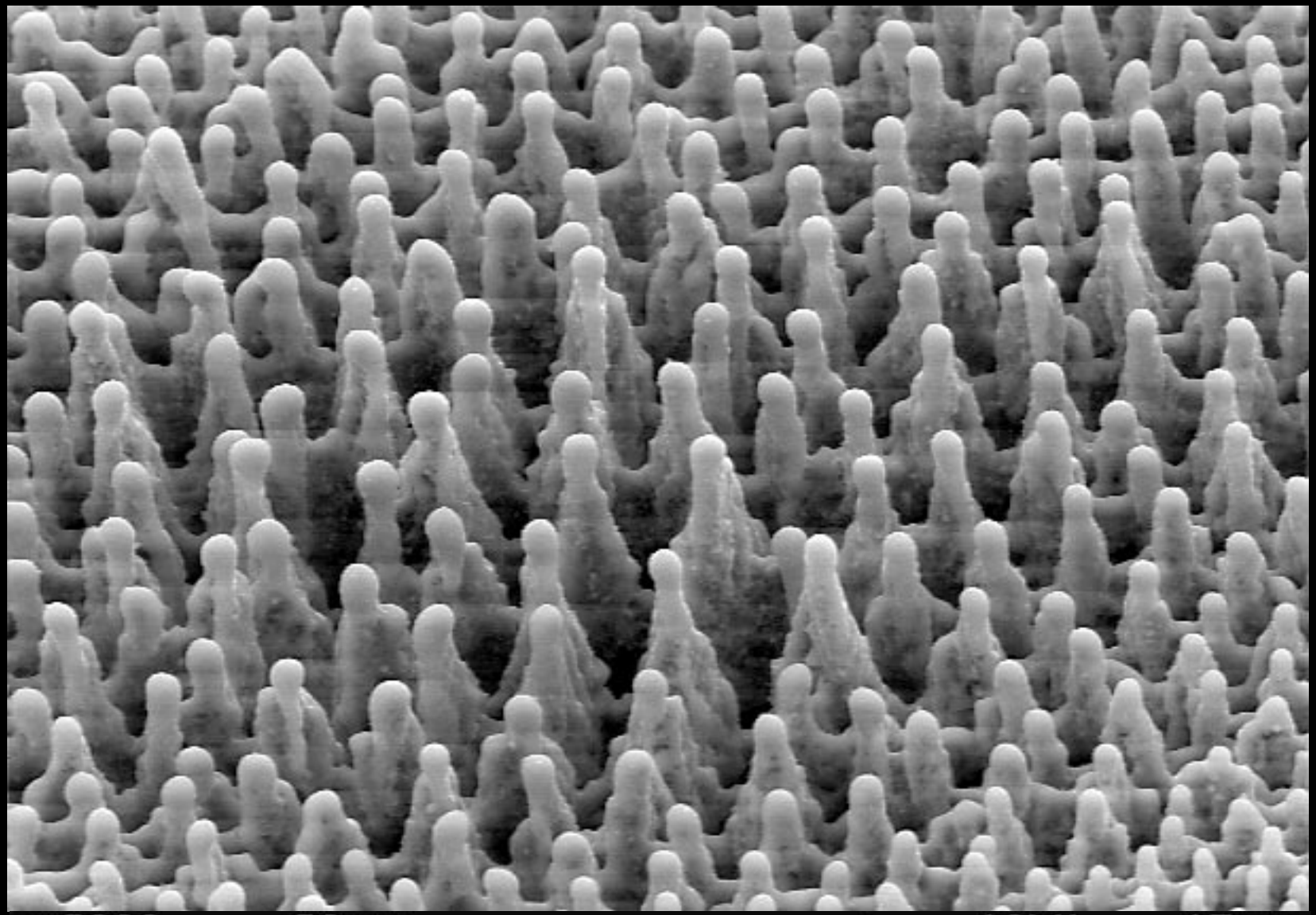
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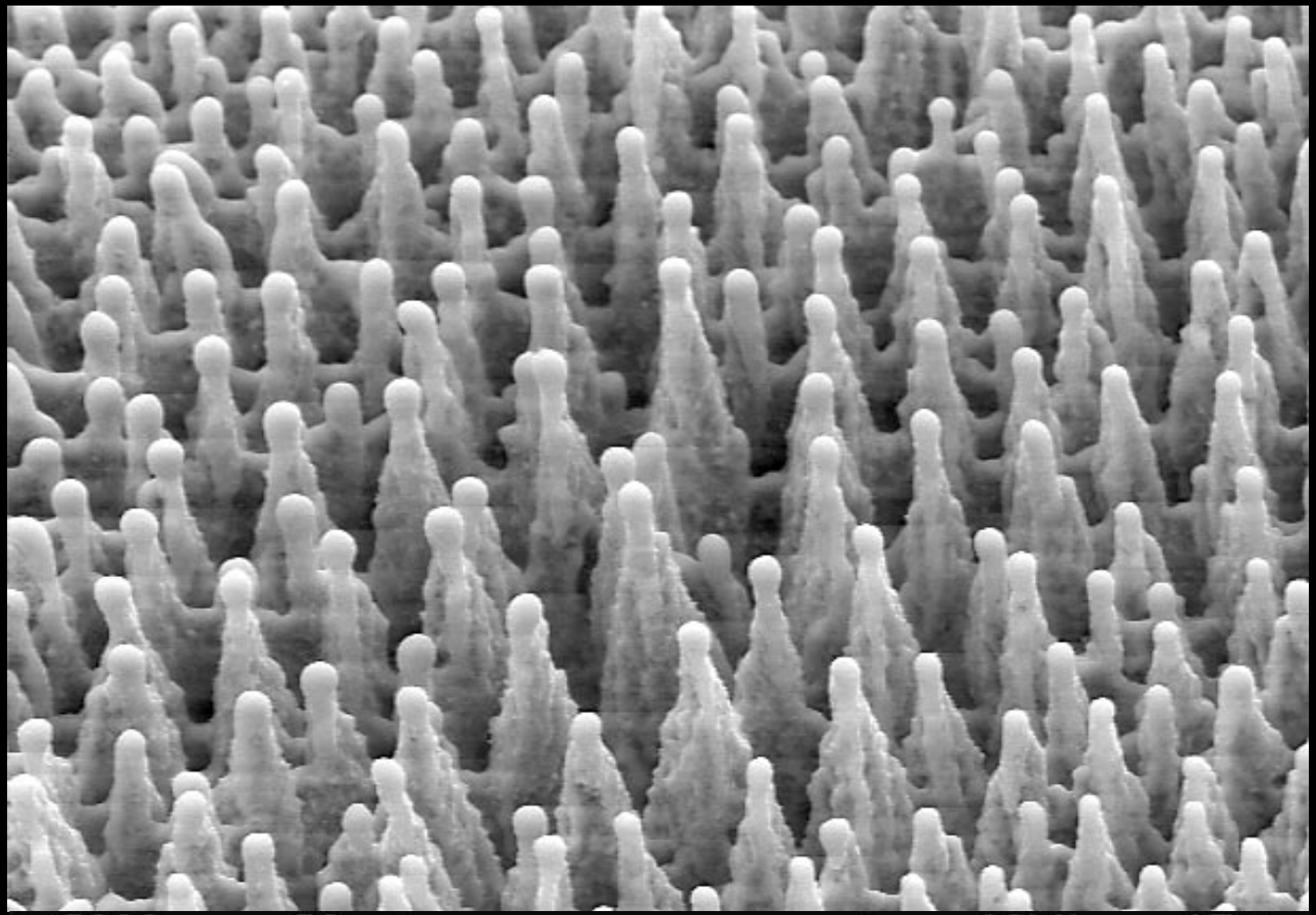
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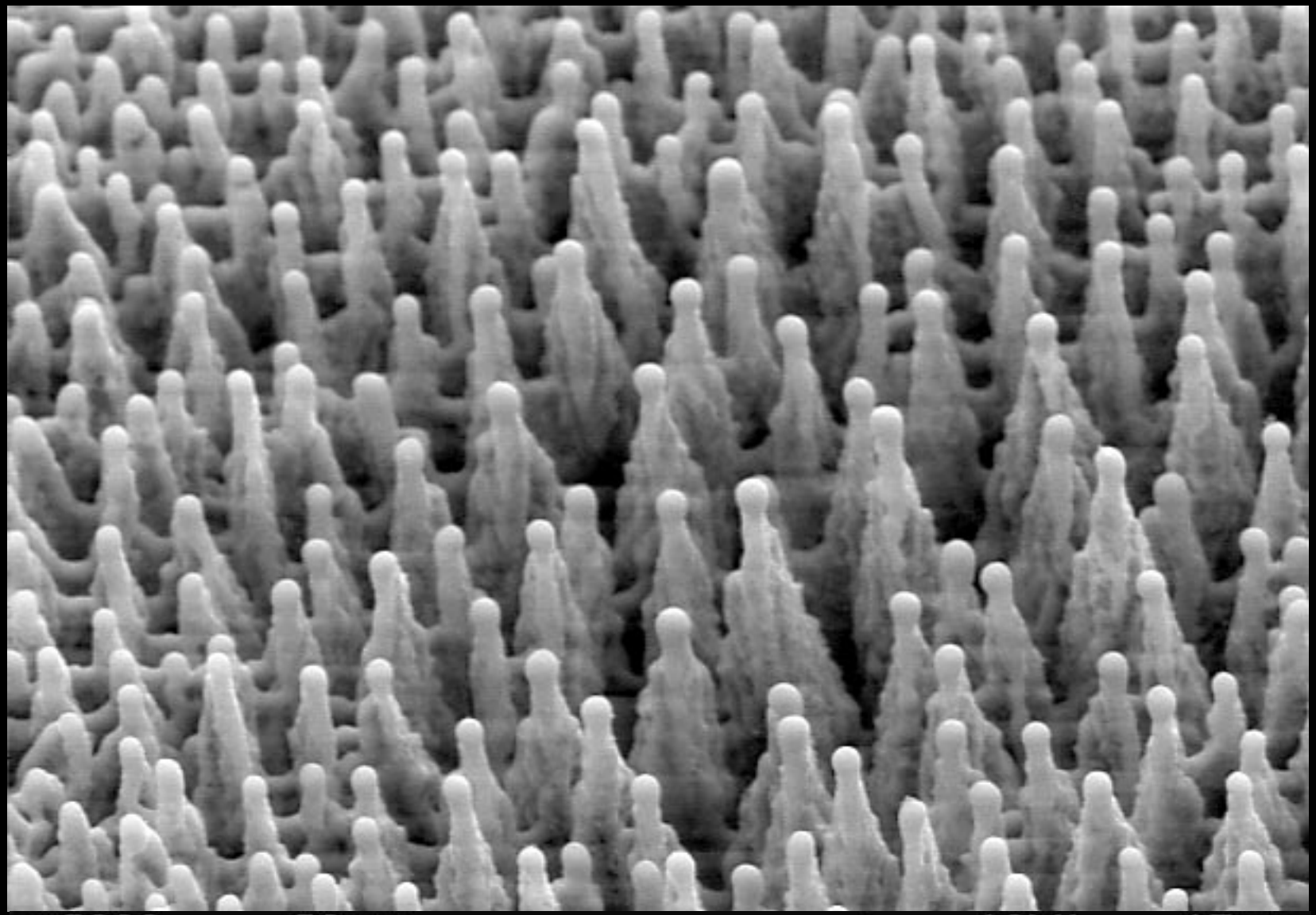
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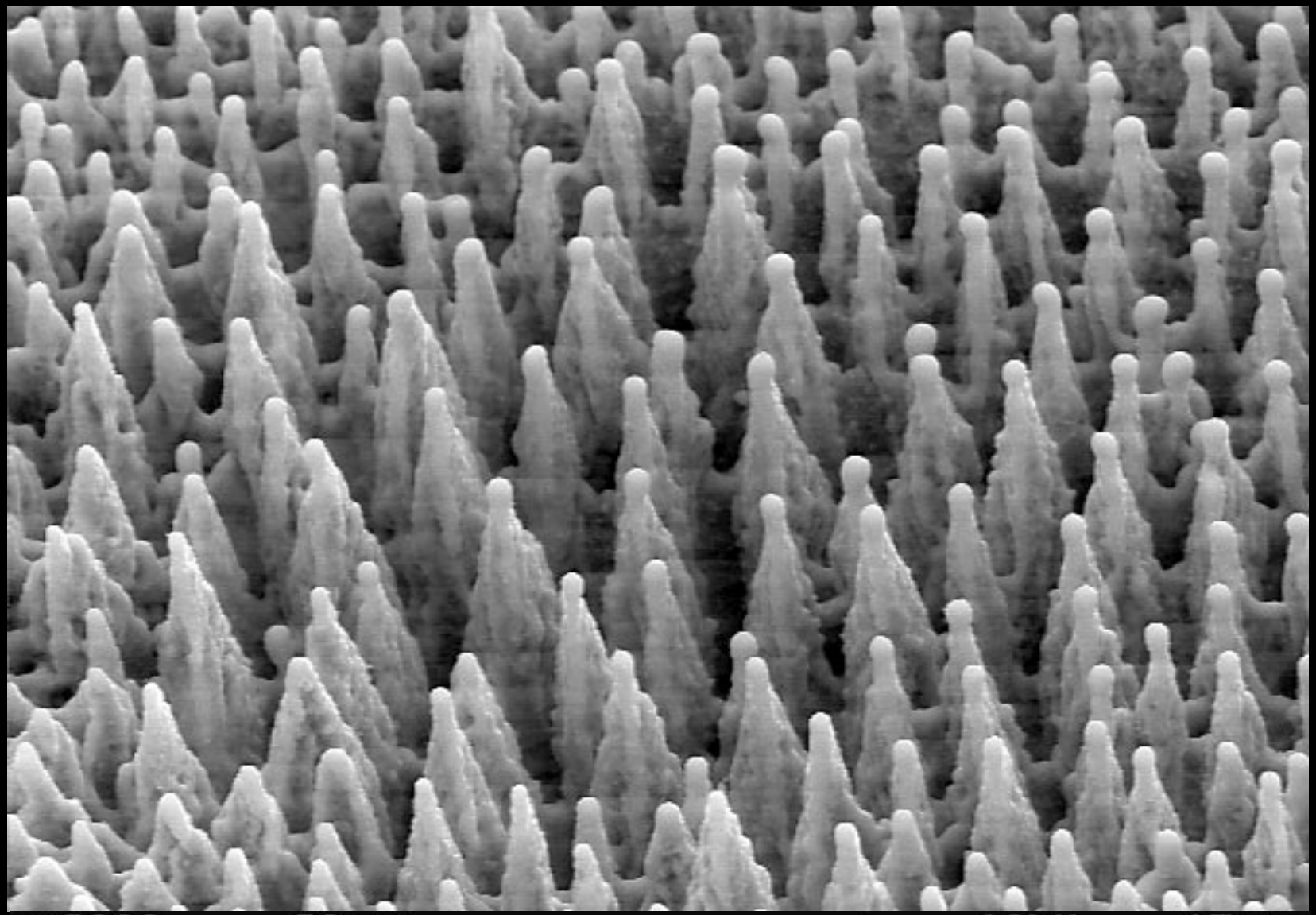
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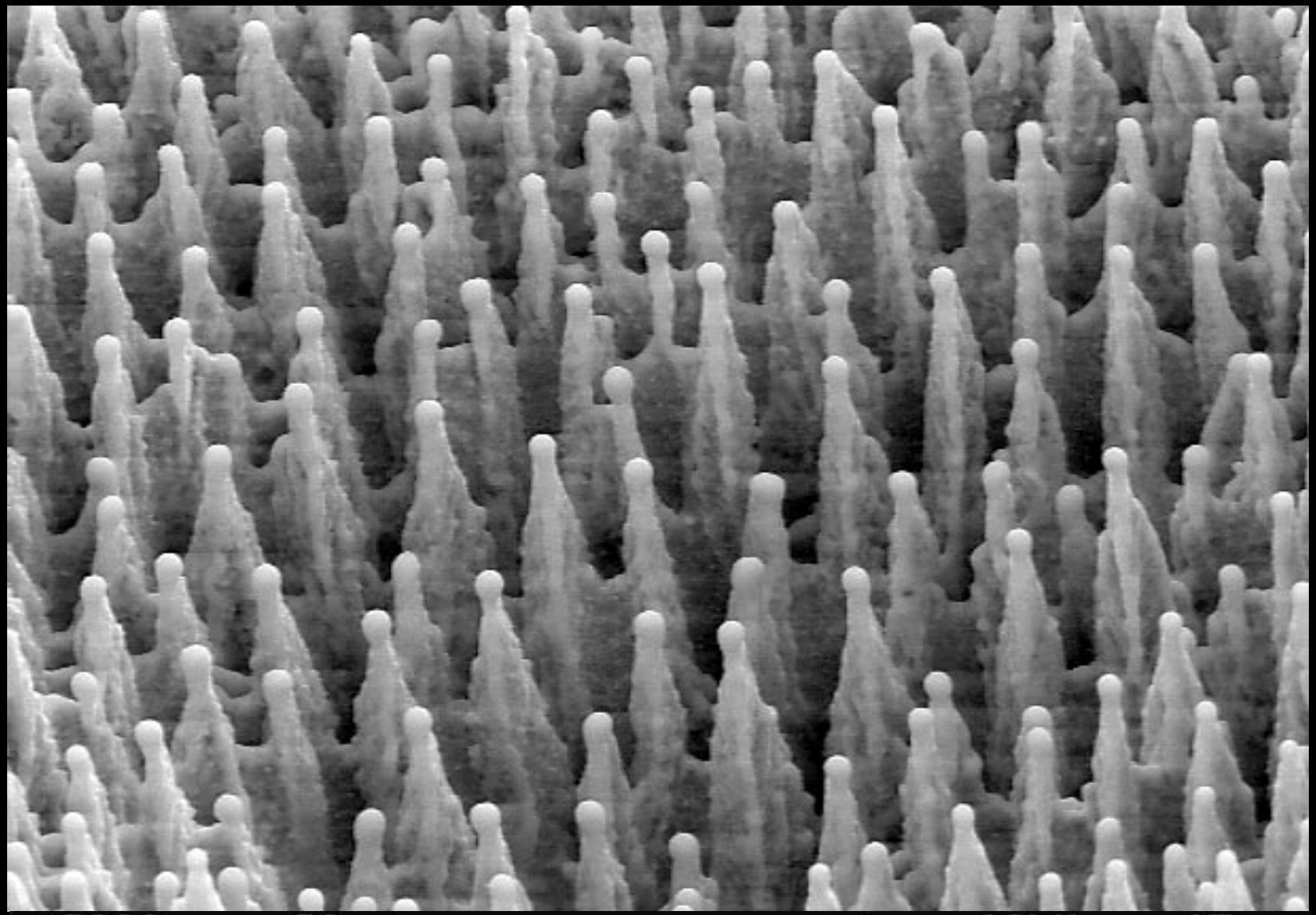

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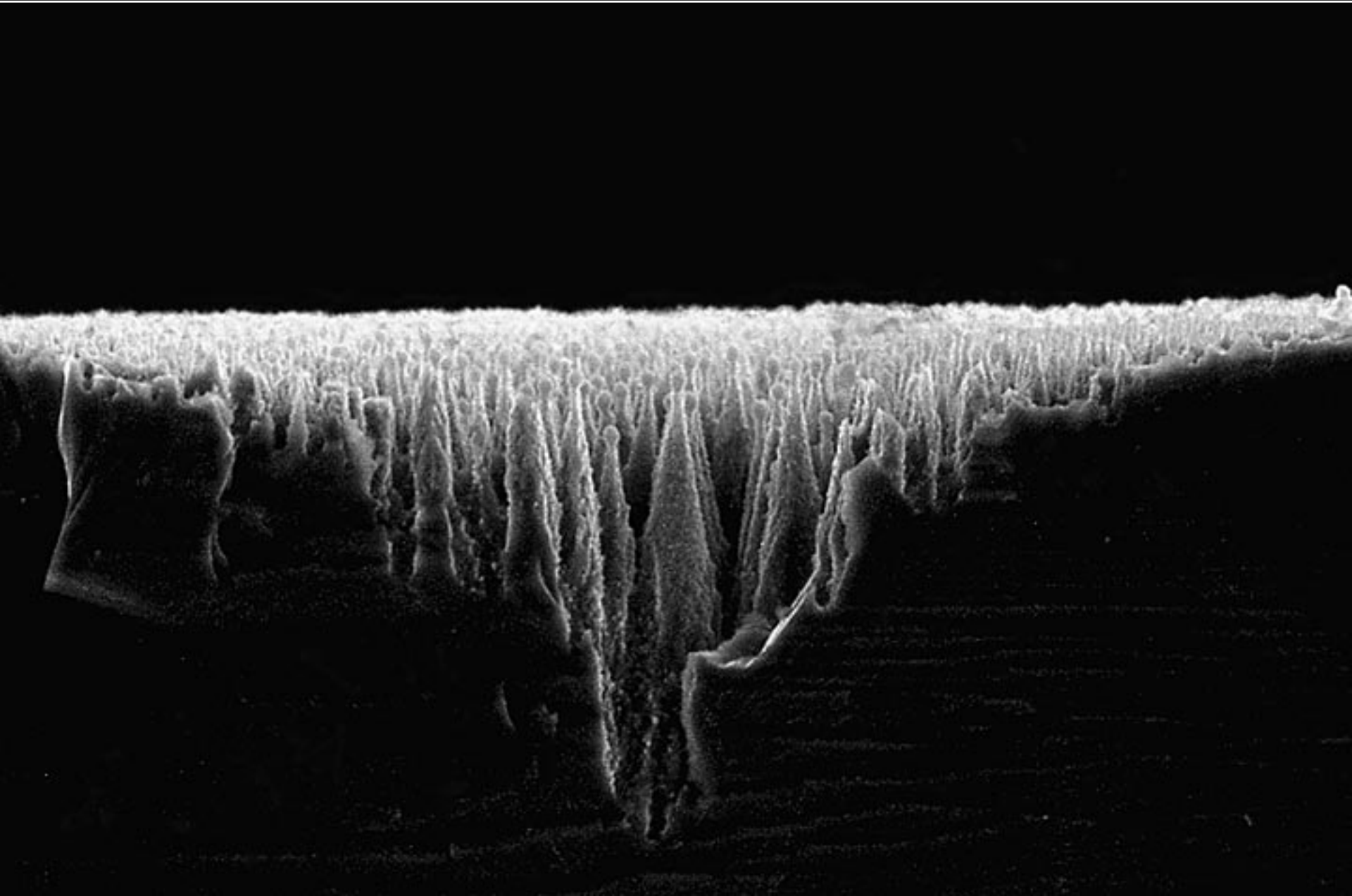
Mechanism



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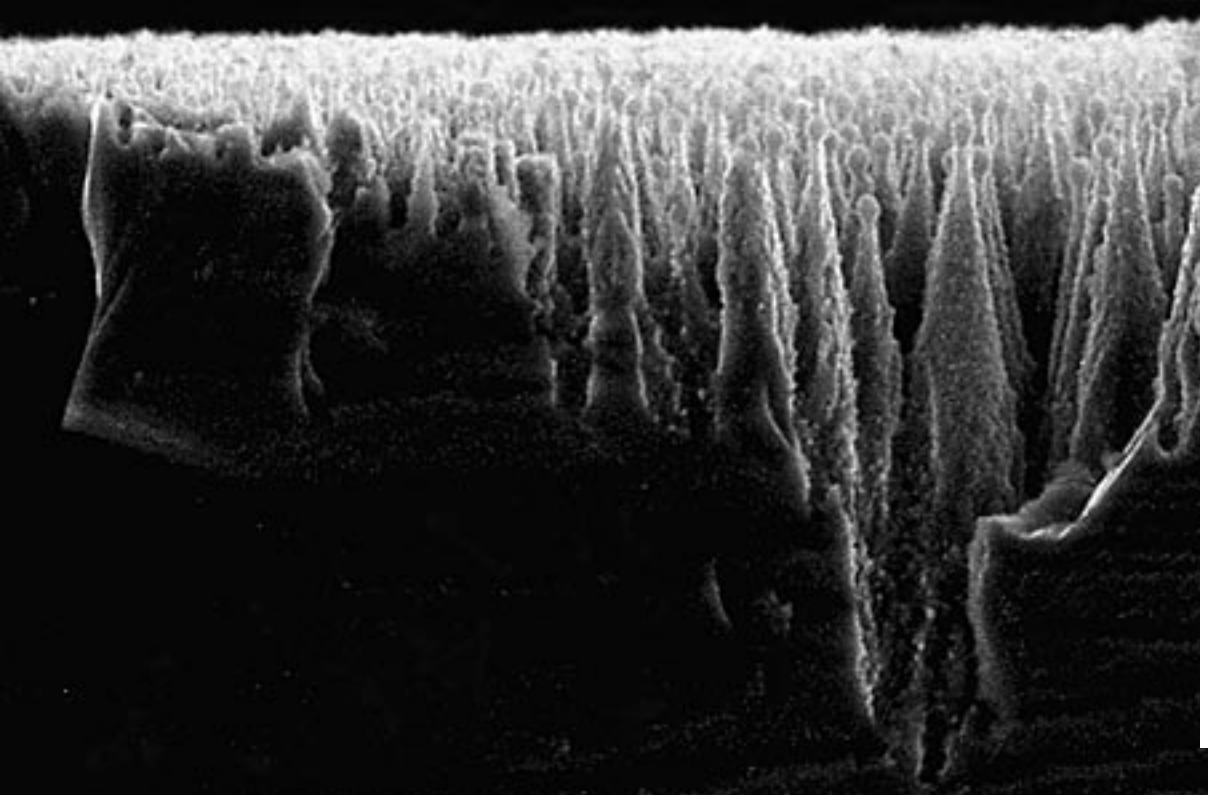

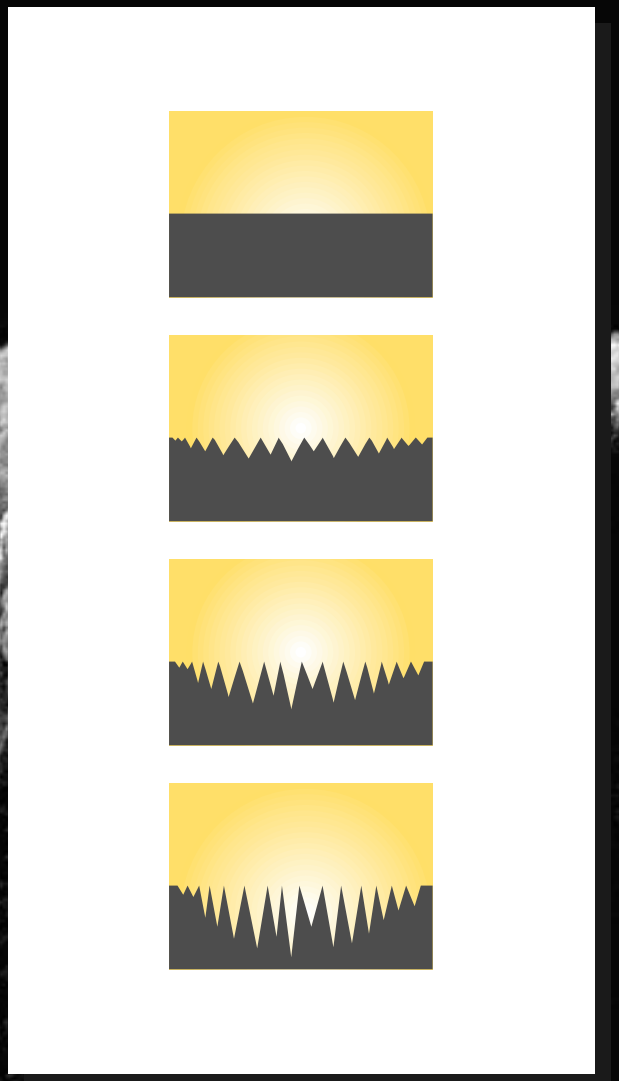

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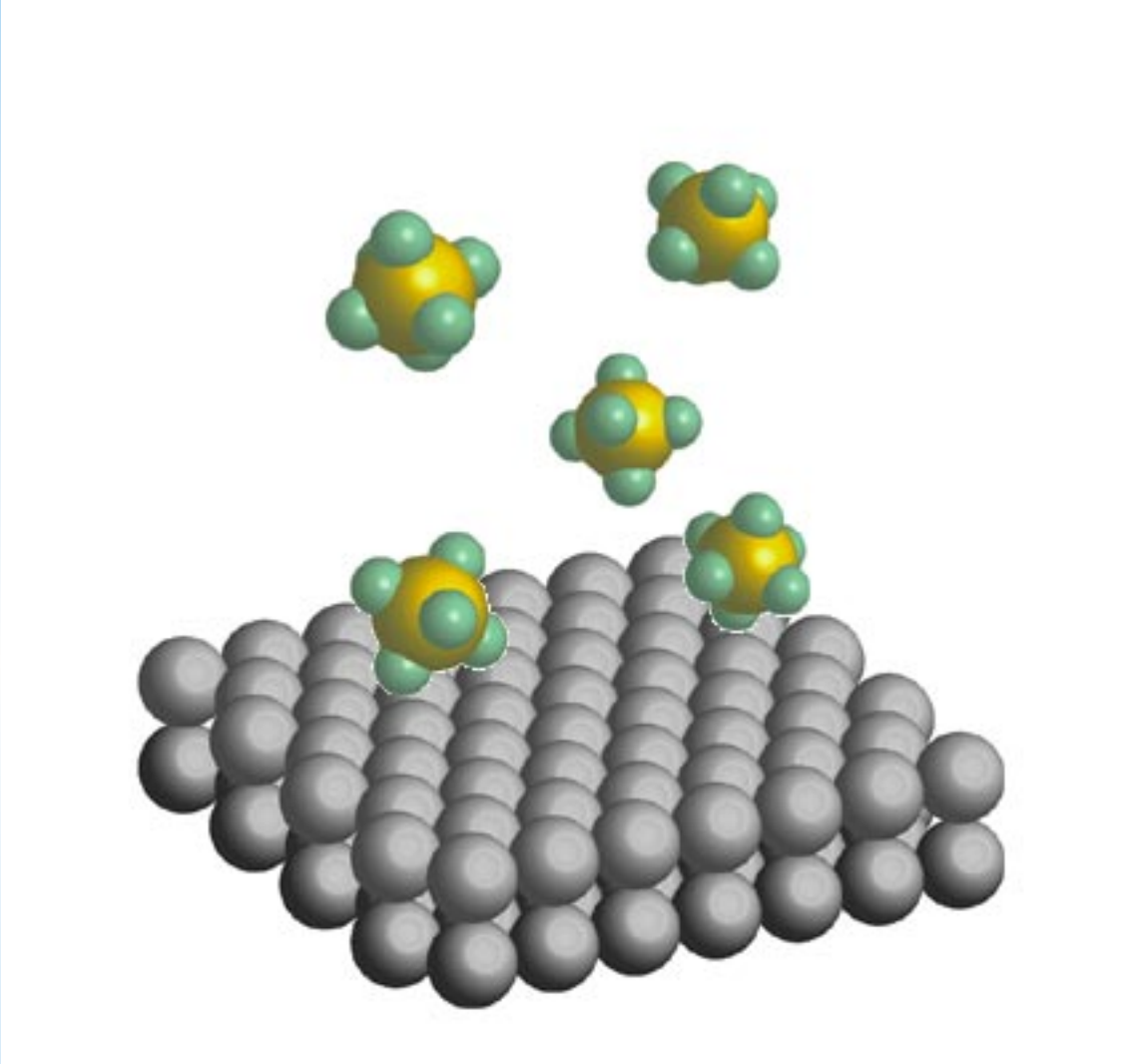

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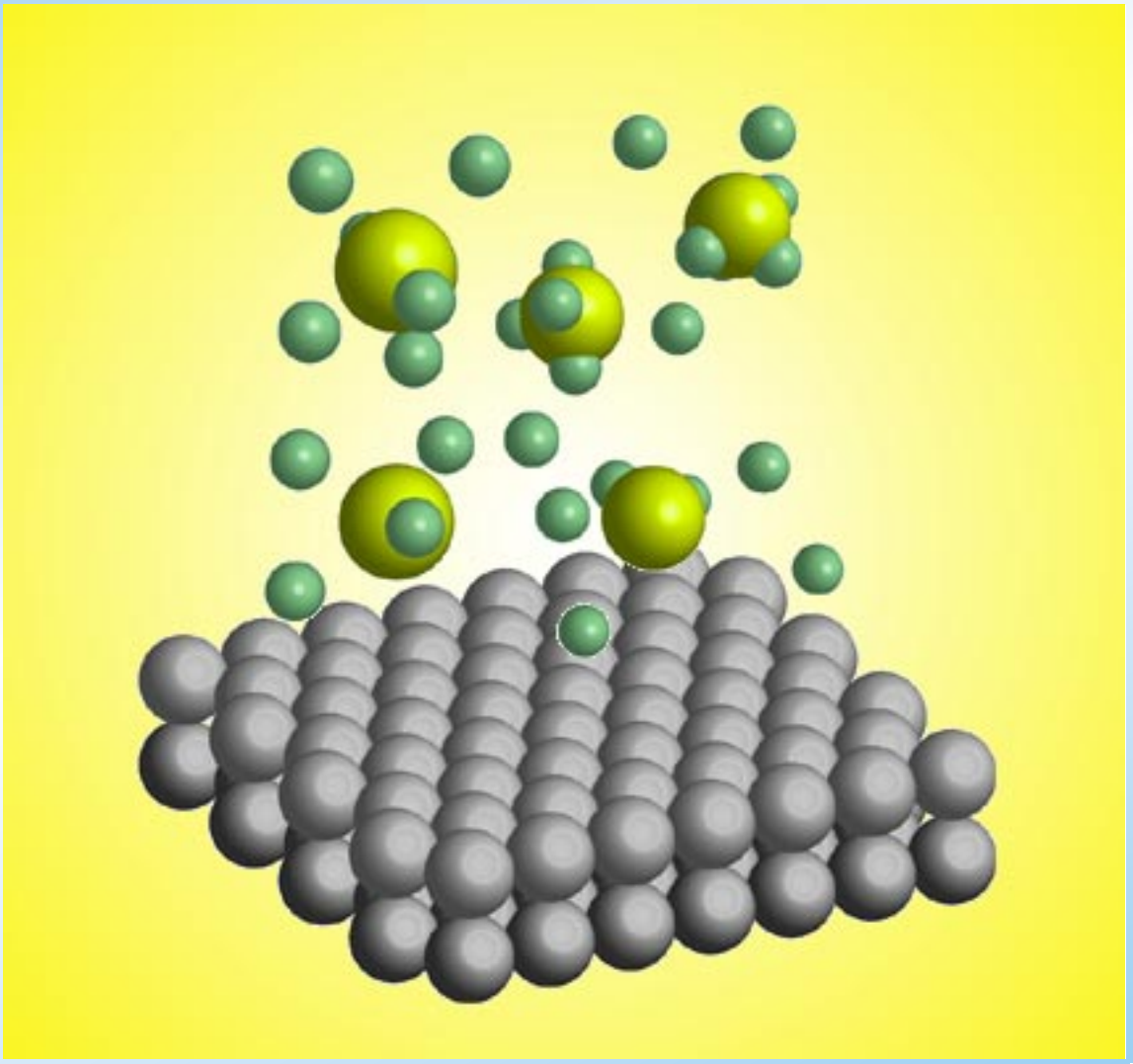

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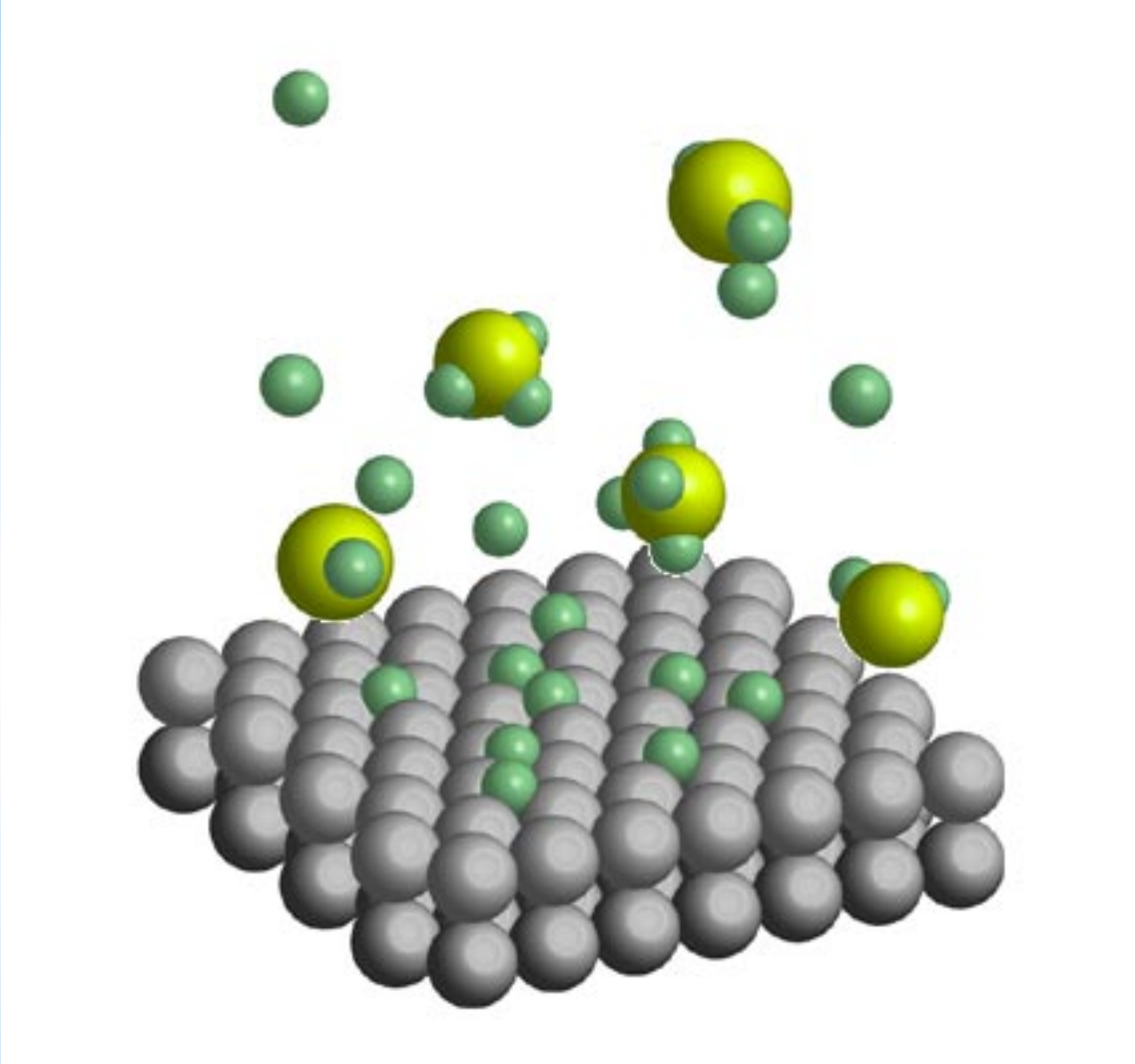

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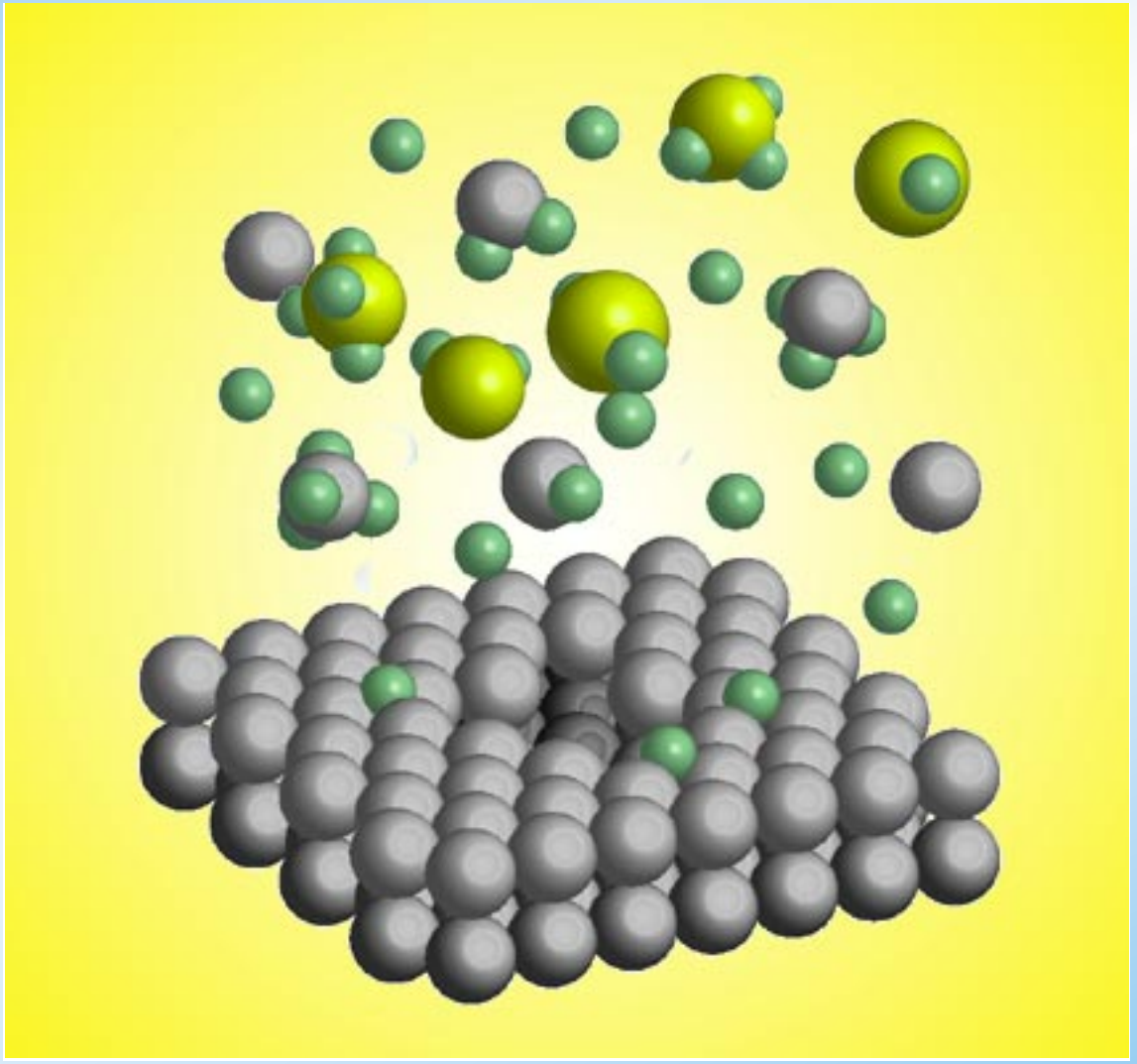
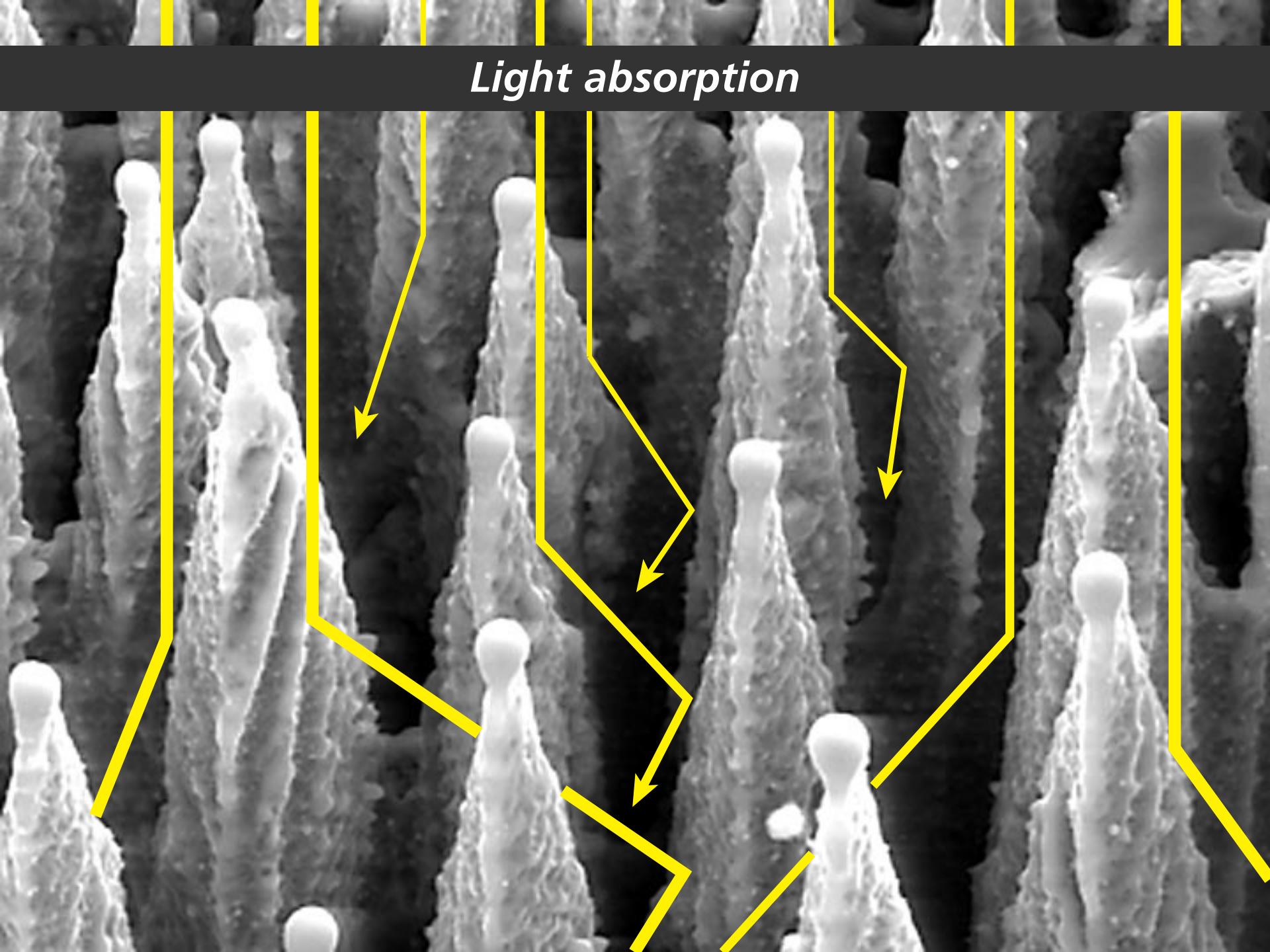
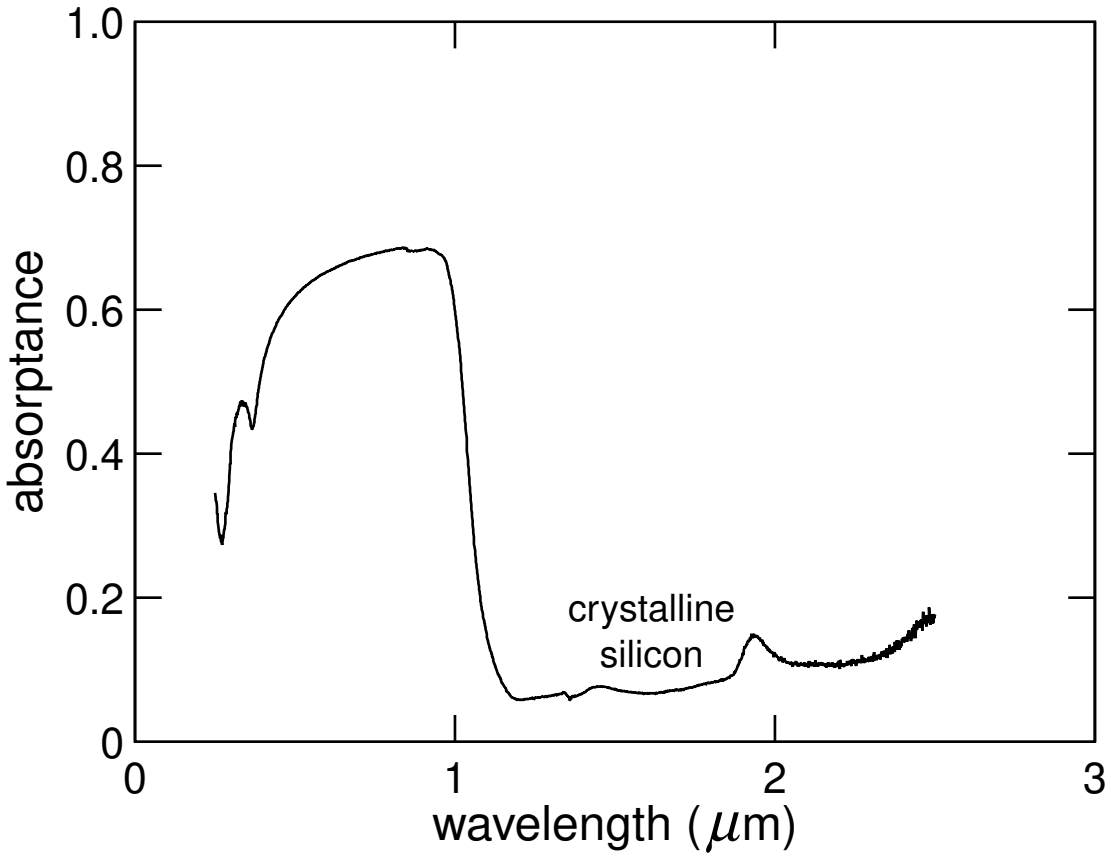


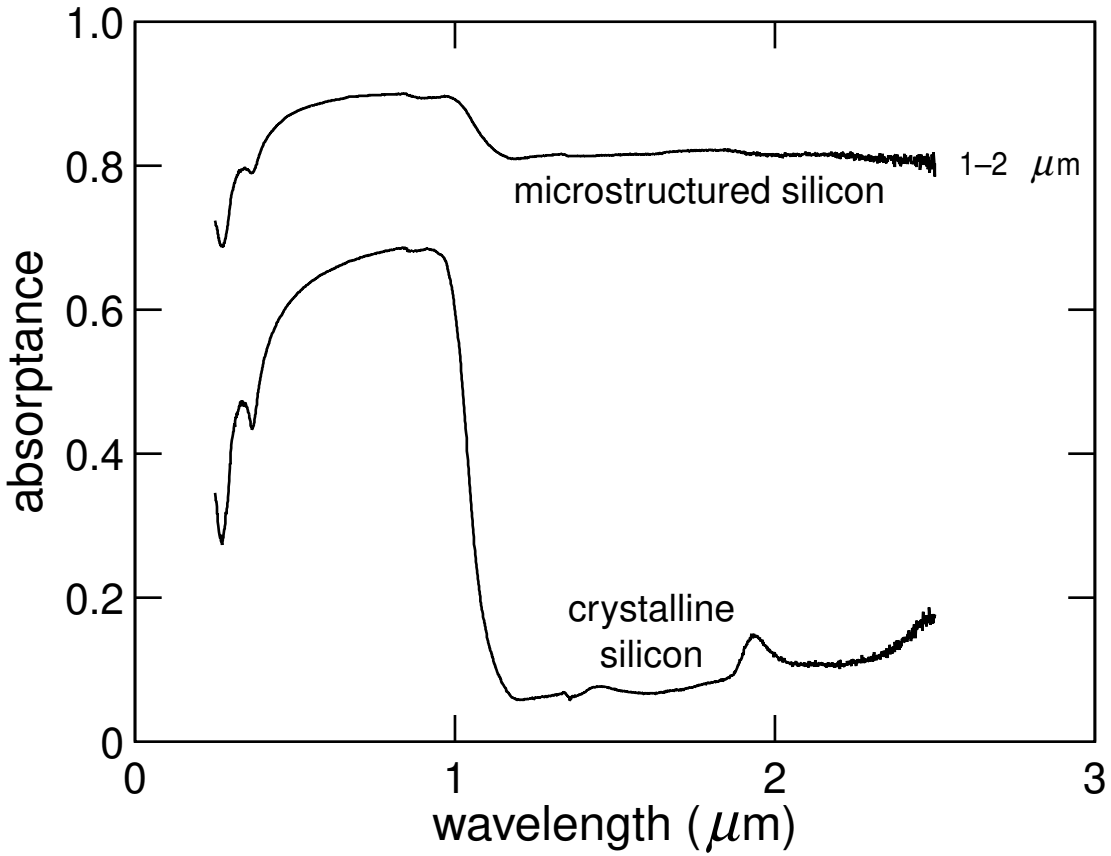

Light absorption

Light absorption



C. Wu, *et al.*, *Appl. Phys. Lett.* 78, 1850 (2001)

Light absorption



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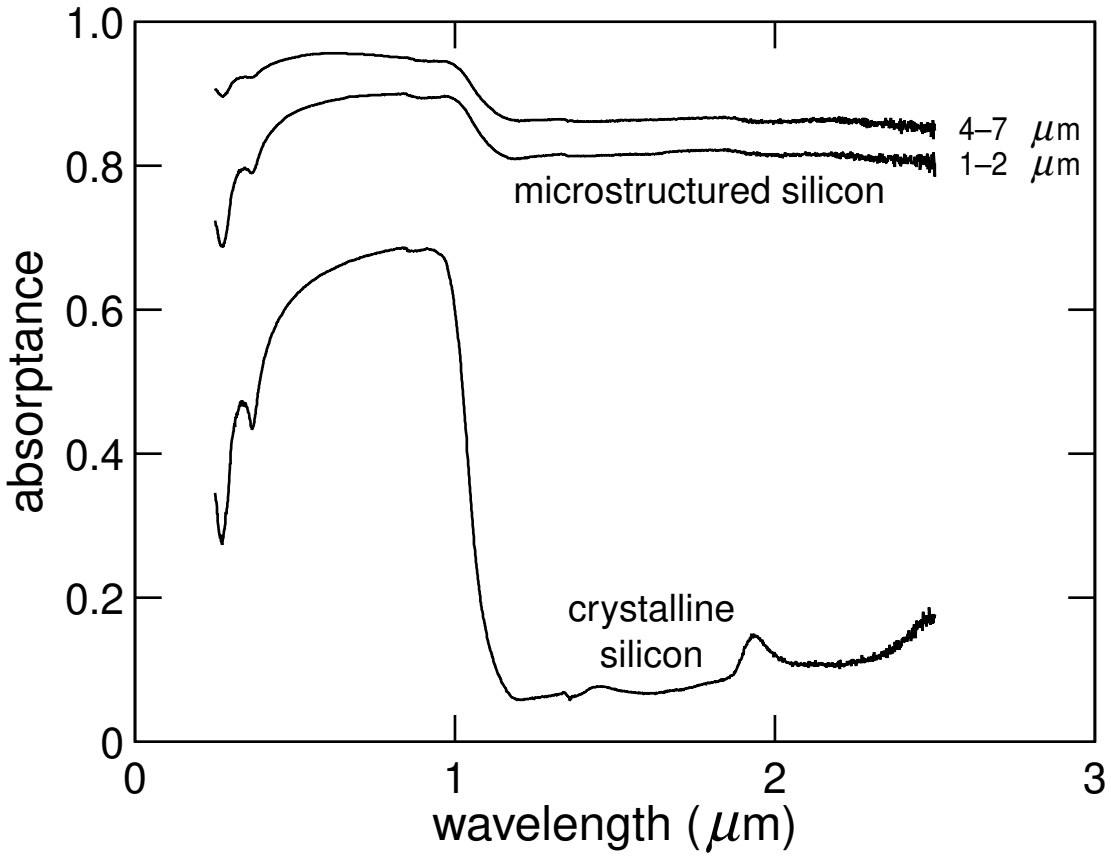
Light absorption



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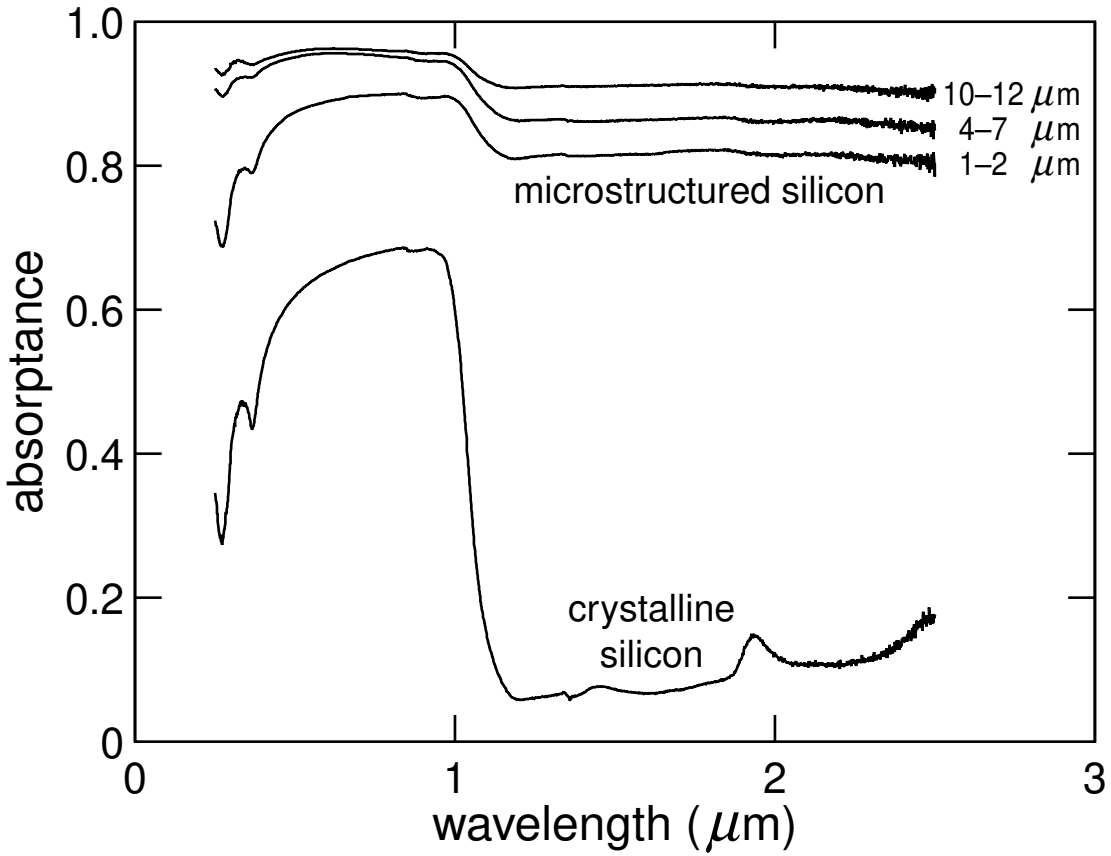
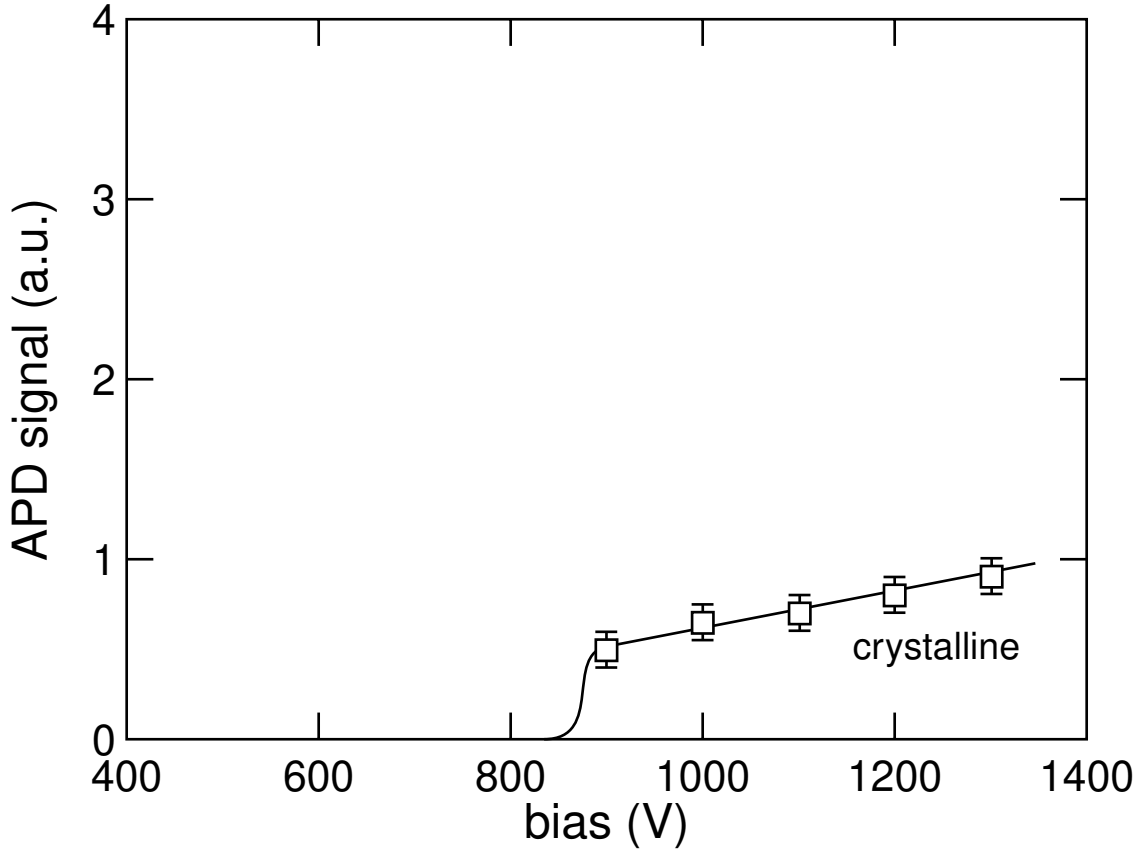


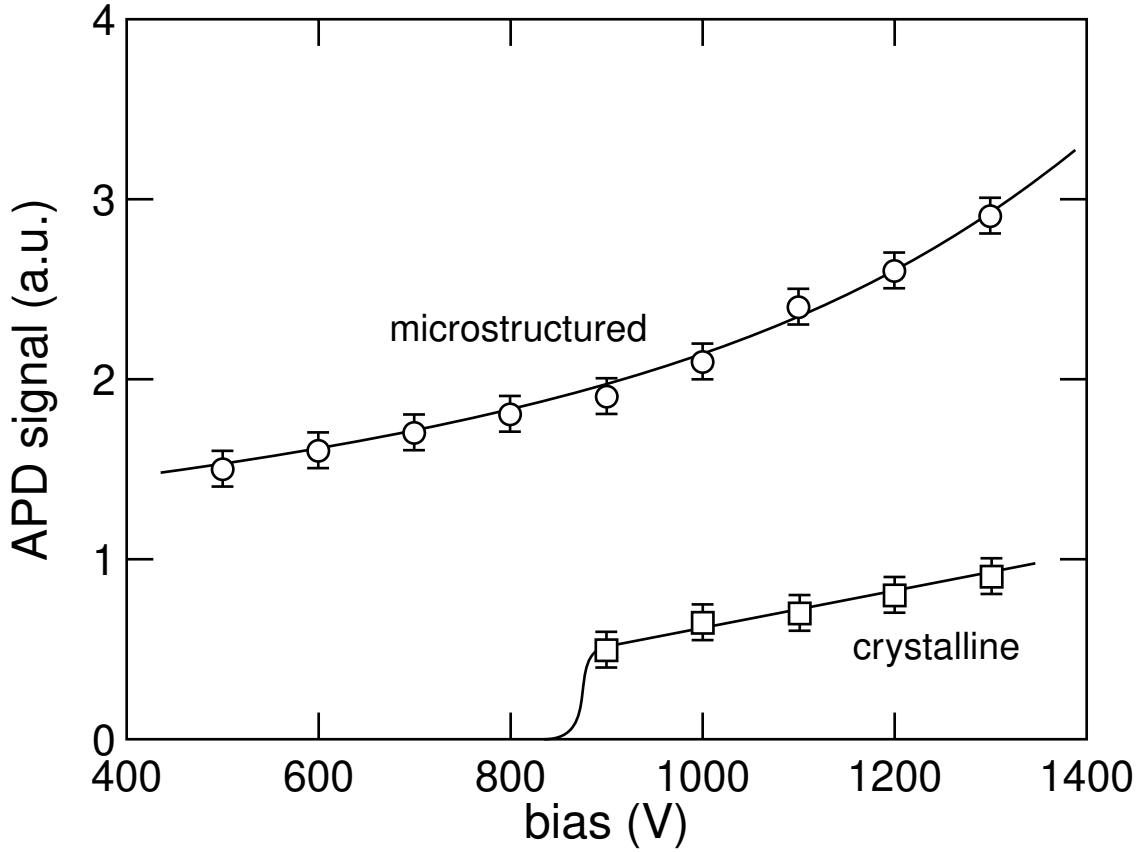
C. Wu, *et al.*, *Appl. Phys. Lett.* 78, 1850 (2001)

IR photocurrent



in collaboration with RMD

IR photocurrent



in collaboration with RMD

Summary

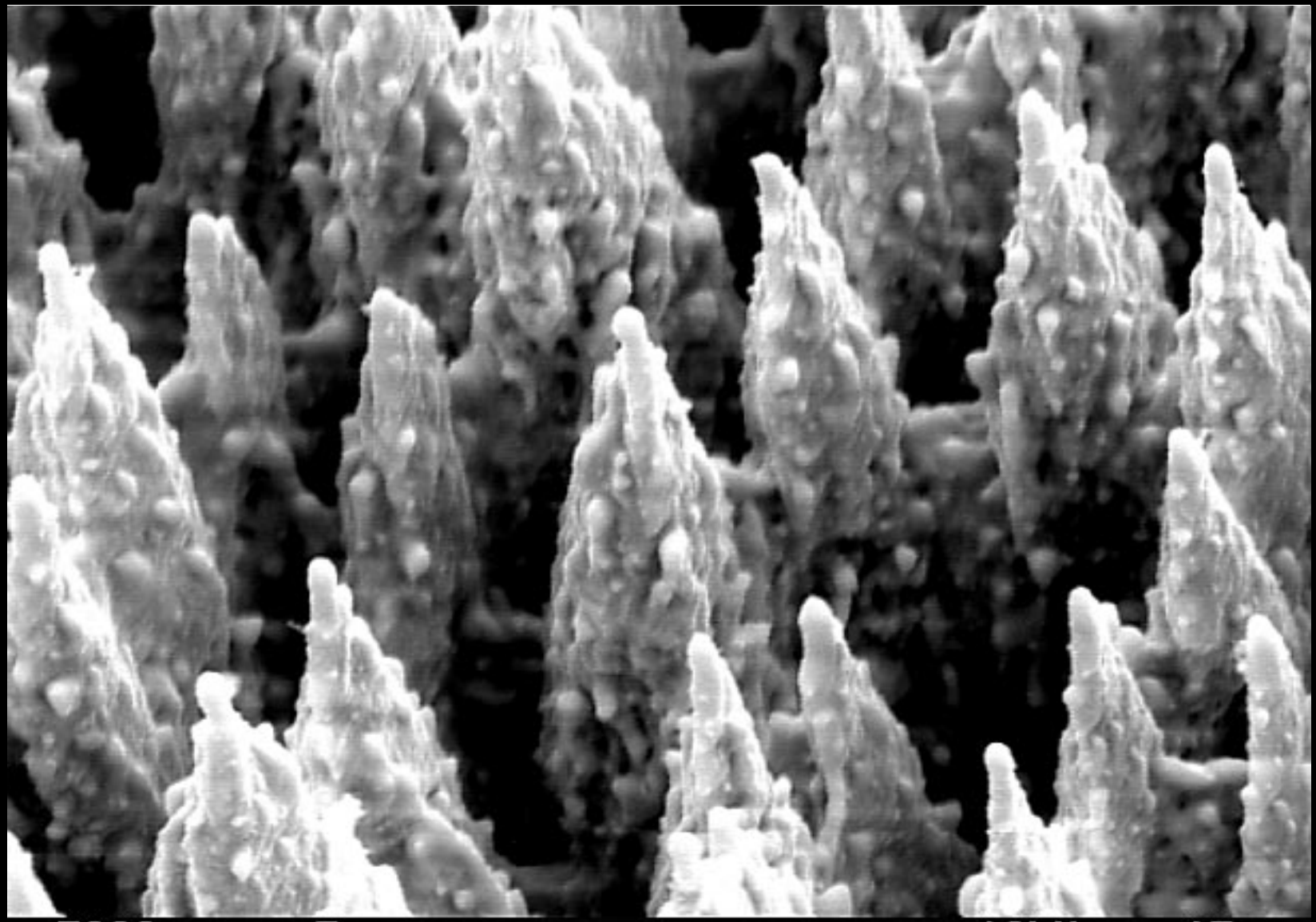
- Novel technique for producing spikes
- Unity light absorption
- Luminescence
- Field emission

Funding: Army Research Office

For a copy of this talk and

additional information, see:

http://mazur-www.harvard.edu



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