Structural and electrical properties of Indolocarbazole derivatives films: A scanning probe microscopy study

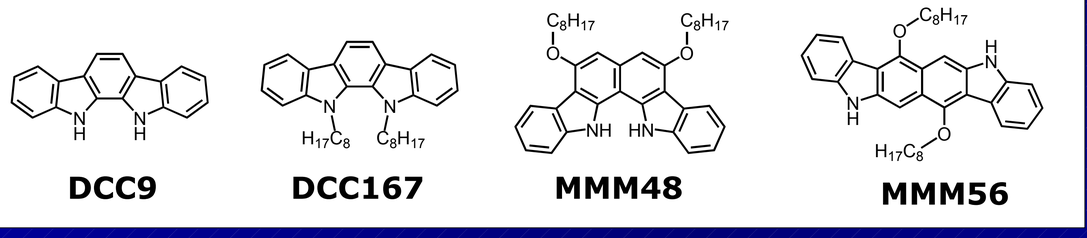
Jose. Abad[1], Inés Nieto[1], Miriam Más-Montoya[2], David Curiel, Jaime Colchero[1]

[1] Departamento de Física, Centro de Investigación en Óptica y Nanofísica (CIOyN), Universidad de Murcia, Campus Espinardo, 30100 Murcia, Spain.
[2] Departamento de Química Orgánica, Universidad de Murcia, Campus Espinardo, 30100 Murcia, Spain.

Motivation

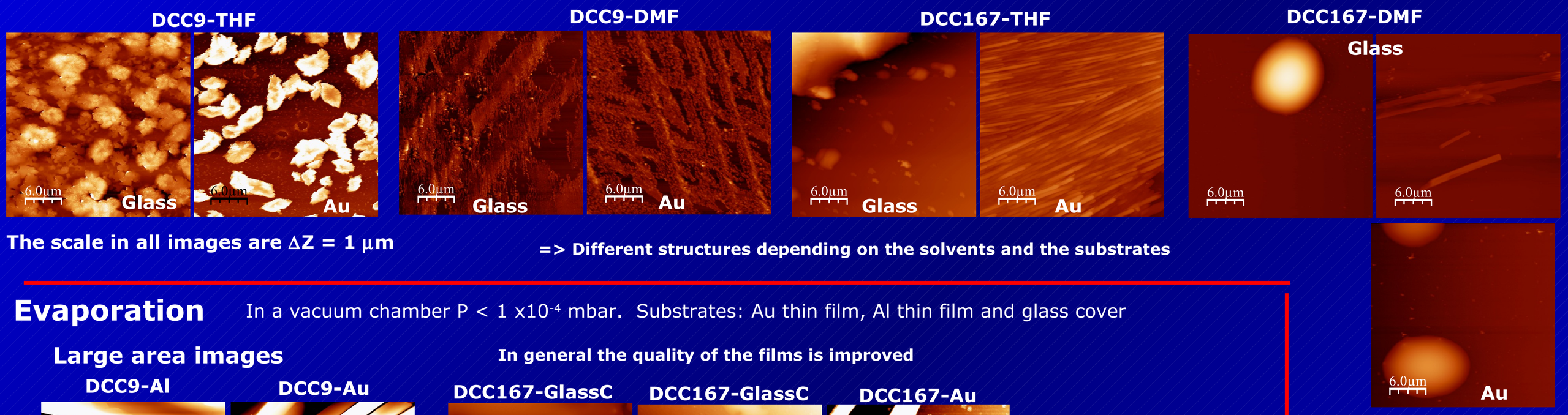
Organic conjugated compounds based on indolocarbazole derivatives have attracted much attention in view of the prospective applications of these conjugated materials in organic electronics. We have obtained very promising conductivity results (10^{-2} S/cm). However, we have found a data variance from 10^{-2} to 10^{-8} S/cm for the same set of samples. These results point out the importance of the morphology in the conductivity properties. In the present work we apply scanning probe microscopy (SPM) techniques to study, on a nanometer scale, the morphology of these molecules prepared from different methods.

Molecules



Spin cast

20 mg/ml solutions in THF tetrahidrofuran or DMF dimetilformamide; Spin cast at 2500-4000 rpm; Substrates Au thin film and glass cover



The scale in all images are ΔZ = 1 µm

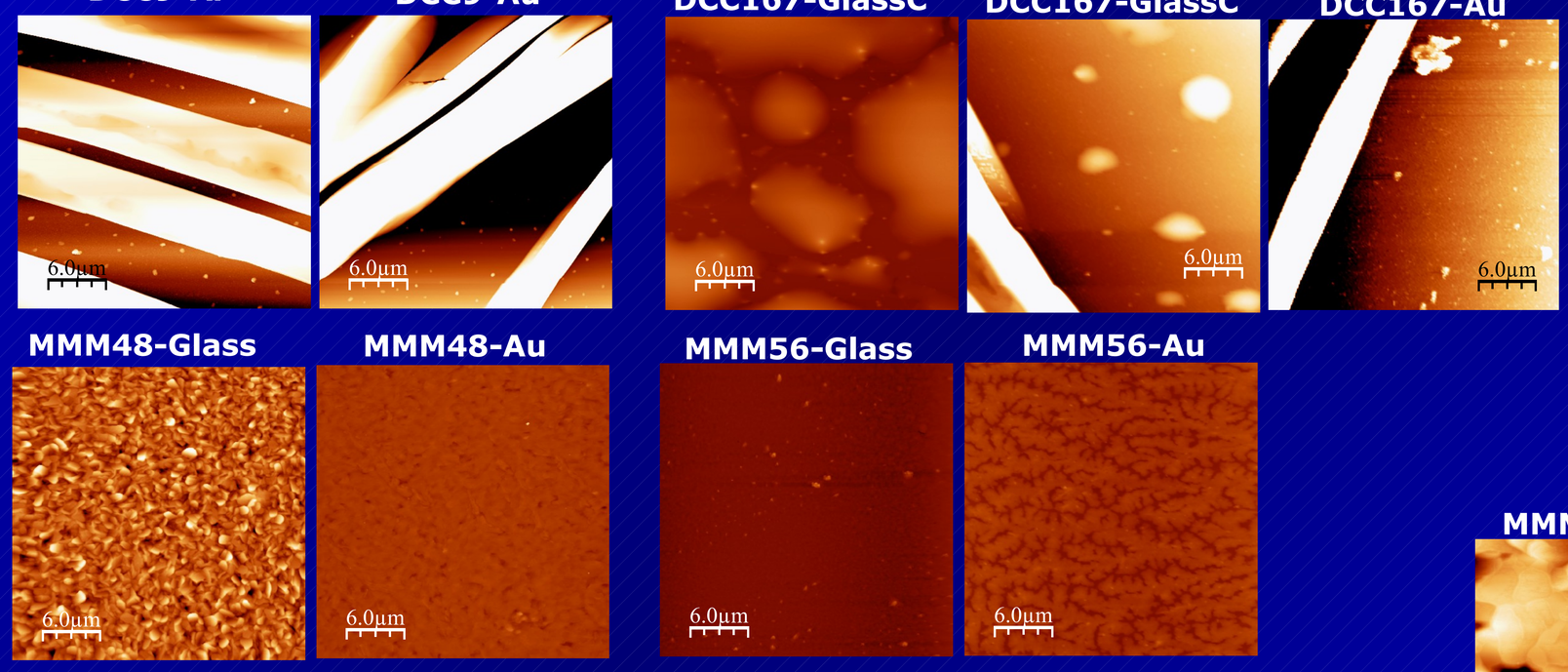
=> Different structures depending on the solvents and the substrates

Evaporation

In a vacuum chamber P < 1 x10^{-4} mbar. Substrates: Au thin film, Al thin film and glass cover

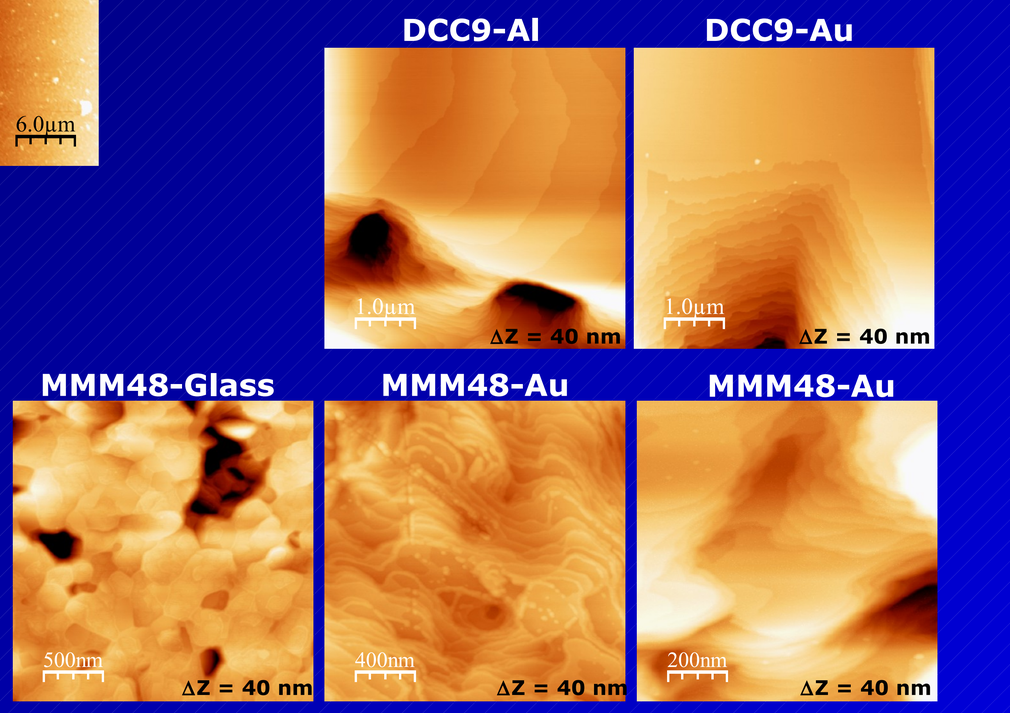
Large area images

In general the quality of the films is improved



The scale in all large area images are ΔZ = 0.5 µm

Small area images



Flat terraces are observed, the size depends of the kind of molecule and the substrate

Kelvin Probe Microscopy

Different contact potential regions are observed

Conclusions

We have found a very rich nanostructure, depending on the films growth conditions (spin coating or vacuum evaporation) as well as the different substituted group added to the molecule.

These results can help us to understand the variability in the conductivity properties in terms of the films morphology