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Spontaneous wrinkling of soft matter by energetic deposition of Cr and Au

Journal of Applied Physics **119**, 145305 (2016); <https://doi.org/10.1063/1.4946036>F. S. Teixeira^a, W. W. R. Araújo, and M. C. Salvadori[View Affiliations](#)[View Contributors](#)[PDF](#)

Wrinkling of stiff thin films deposited on compliant substrates is an effect that has been broadly investigated. However, wrinkling consequent to metal ion implantation has been less studied. In the work described here, we have explored the sub-micron wrinkling phenomena that *spontaneously* occur when metal ions (Au and Cr) are implanted with energy of a few tens of electron volts (49 eV for Au and 72 eV for Cr) into a compliant material (PDMS). This very low energy ion implantation was performed using a Filtered Cathodic Vacuum Arc technique, a process often referred to as energetic deposition or energetic condensation. For comparison, Au and Cr depositions with similar doses were also done using a sputtering technique (with lower particle energy of approximately 2 eV), and no wrinkle formation was then observed. In this way, we can discuss the role of ion energy in wrinkle formation. Depth profiles of the implanted material were calculated using the Tridyn computer simulation code for each metal, for several implantation doses. UV-vis absorption spectroscopy analysis confirmed the presence of metal nanoparticles. Atomic Force Microscopy imaging with spectral processing was used to compare the wrinkle morphology for each case investigated.

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