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A simple fabricated thickness-based stiffness gradient for cell studies

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Abstract

In this work, we developed a simple method to fabricate a thickness-based continuous stiffness gradient for biological studies. It was made by glass slides, polydimethylsiloxane (PDMS) pre-polymer, spacer and clips only, without any sophisticated equipment. It is easy to fabricate in any general biological and pharmaceutical laboratories. The stiffness gradient was characterized in terms of apparent Young's modulus by atomic force microscopy (AFM) and the Young's modulus along the gradient was found to be 8.5 to 120 kPa, which is within the physiological relevant range. HeLa-C3 cells were cultured on the gradient to study their morphological behavior according to the substrate stiffness. Furthermore, the drug efficiency of etoposide, an anti-cancer drug, was studied along the substrate stiffness gradient. It was found that HeLa-C3 cells cultured on the soft region of the gradient (8.5–11 kPa) are more sensitive to etoposide. We believe the proposed device could promote cell investigations and drug screenings on a substrate with comparable stiffness to the native tissue.

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