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Exploring 2D shape space: the hunt for the densest RSA packings

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Random sequential adsorption (RSA) of various polydisks and rounded polygons is studied to determine the shape, which forms the densest packings. Covariance matrix adaptation evolution strategy (CMA-ES), an evolutionary optimization algorithm is used to search for optimal shapes. We found that independently of the number of component disks, the optimal polydisk resembles a triangle with rounded corners. Therefore we also explored variously parametrized spaces of rounded polygons using the same approach. All carried out optimizations indicate that the shape building the densest RSA packings is the rounded triangle for which the packing fraction is 0.600608 ± 0.000017 , which is the highest known value so far. Properties of the triangle's contact function can be used to illustrate why this shape is capable of forming dense RSA packings.

Primary author: Mr KOZUBEK, Konrad (Jagiellonian University)

Co-authors: KUBALA, Piotr (Jagiellonian University); CIESLA, Michal (M. Smoluchowski Institute of Physics, Jagiellonian University, Kraków, Poland); BAULE, Adrian (Queen Mary University of London)

Presenter: Mr KOZUBEK, Konrad (Jagiellonian University)

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