

# 1 Geometry of Biofilm Carriers: A Systematic Review Deciding the Best 2 Shape and Pore Size

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## 10 **Abstract**

11 Shapes and pores of biofilm carriers play a major role in deciding fluidization efficiency, biomass  
12 immobilization and removal efficiency. However, little is known about their impact on the efficiency  
13 of bioremediation. This review study sheds light on the function of carrier geometry (i.e., pores and  
14 shapes) on the bioremediation productivity, where the wrong selection of such carrier geometry  
15 may prevent attached microbes at the core from accessing nutrients. It was found that the ideal  
16 porous biofilm carrier undoubtedly has to be spherically shaped, with ridges on its surfaces, and  
17 characterized by larger than 1 mm of irregular pore size openings. The irregular pore openings  
18 provide various environments to culture various cells, develop uneven biofilm, and retain different  
19 sizes of cells and biomass. The findings challenge current literature knowledge and commercial  
20 strategies that have chosen the surface area as the critical factor.

21 **Keywords:** Carrier geometry; Surface pores; Bed clogging; Kaldnes; Corrugated surfaces.

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