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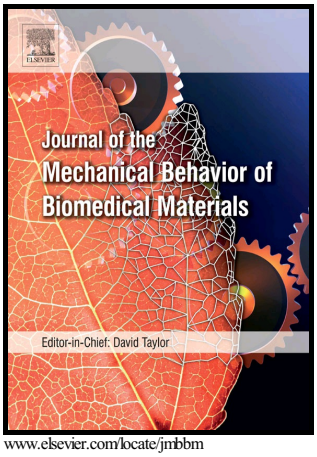

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Abstract

Squamate reptiles (around 10,000 species of snakes and lizards) comprise a myriad of distinct terrestrial vertebrates. The diversity within this biological group offers a great opportunity for customized bio-inspired solutions that address a variety of current technological problems especially within the realm of surface engineering and tribology. One subgroup within squamata is of interest in that context, namely the legless reptiles (mainly snakes and few lizards). The promise of that group lies within their functional adaptation as manifested in optimized surface designs and locomotion that is distinguished by economy of effort even when functioning within hostile tribological environments. Legless reptiles are spread over a wide range in the planet, this geographical diversity demands customized response to local habitats. Customization, in turn, is facilitated through specialized surface design features. In legless reptiles, micro elements of texture, their geometry and topological layout advance mitigation of frictional effects both in locomotion and in general function. Lately, the synergy between functional traits and intrinsic surface features has emerged as focus of research across disciplines. Many investigations have sought to characterize the structural as well as the tribological response of legless species from an engineering point of view. Despite the sizable amount of data that have accumulated in the literature over the past two decades or so, no effort to review the available information, whence this review. This manuscript, therefore, endeavors to assess available data on surface metrology and tribological behavior of legless reptiles and to define aspects of that performance necessary to formulate an advanced paradigm for bio-inspired surface engineering.

Nomenclature

A_{real}	real area of contact between the contacting region of the reptile and the substrate
F_f	Friction force
F_s	shear component of friction force
F_{pl}	ploughing component of friction force
M	Mass
Ra	Mean arithmetic value of roughness (μm)
R_{ku}	Profile Kurtosis parameter
Rq	Root mean square average of the roughness profile ordinates (μm)
R_{sk}	Profile skewness parameter
R_T	Radius of curvature in transverse direction

Directions

AE-PE	Anterior Posterior
RL-LL	Lateral Axis
LR	Lateral right hand side
LL	Lateral left hand side