# HIGHLIGHTING A UNIVERSAL BEHAVIOR IN THE PERMEABILITY OF FIBROUS CARBONS

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Fluid flow through porous media is of great interest for engineering sciences. As far as fibrous carbons are concerned, phenomena encountered in filters, adsorbents, catalyst supports, fuel cells, membranes and composites manufacturing process depend critically on permeability. For such applications, predicting the permeability based on porous structure is essential.

Although many works have been devoted to this topic, studies related to carbon materials are scarce, despite their major impact in electrochemistry in general. The obvious increase of permeability with the open porosity was successfully accounted for by either Kozeny-Carman or Tomadakis-Sotirchos equations. The latter, supposedly free of adjustable parameters, is particularly suitable for describing the permeability of random fiber beds, among them gas diffusion layers for fuel cells.

But most studies lack a critical discussion of the corresponding parameters, whose values were predicted for a few ideal cases, but which cannot be used for all situations. This is especially the case of non-woven fibrous carbon materials, whose physical properties are determined by the fabric architecture. As a result, very different permeabilities can be measured at similar porosities, and vice-versa.

In the present work, the static air permeability of not less than 18 different fibrous carbon materials was measured and fitted with the TS equation, with the aim of finding some potentially universal behavior for the tortuosity. A universal curve linking the bulk tortuosity to the so-called Archie's exponent is presented, which encompasses many other fibrous materials, whether carbonaceous or not.

*Preferred participation: Poster presentation*