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Acoustic emission monitoring during gas permeation: a new *operando* diagnostic tool for porous membranes

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Abstract:

In the area of membrane separations the development of powerful *on-line* diagnostic tools allowing the reliability insurance of both membranes and associated processes becomes a major concern. In this context, Acoustic Emission (AE) appears as a potentially attractive method to ensure *i*) quality control for membrane production lines and *ii*) *on-line* monitoring of their evolution when implemented in integrated industrial systems requiring high level of safety/security. In this work, simultaneous gas permeation measurements and acoustic emission technique have been coupled in order to characterize series of porous membranes operating under various conditions. AE events resulting from different gas transport mechanisms through porous membranes series have been identified and classified thanks to a statistical post-treatment of the recorded acoustic signals. A close relationship between AE signal characteristics, physicochemical properties of the porous membranes and associated gas transport mechanisms was established. These promising results constitute a key step in the development of an innovative tool for non-invasive *on-line* diagnosis dedicated to the characterization and control of porous ceramic membranes.

Keywords: Porous ceramic membranes, Acoustic emission, Gas permeation, Transport mechanism, Characterization, *On-line* diagnostic tool.

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