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Does the morphology of fracture surfaces reveal the structure of quasicrystals? LUC BARBIER, DANIEL BONAMY, CEA, Saclay, France, LAURENT PONSON, California Institute of Technology, Pasadena, US — The roughness of surfaces obtained by cleavage of i-AlPdMn quasicrystals at room temperature are analyzed using tools of quantitative fractography. From the atomic scale up to 3 nm, they are shown to exhibit scale invariance properties hiding the cluster (0.45 nm) aperiodic structure. These properties are quantitatively similar to those observed on various disordered materials, albeit on other ranges of length scales. These properties are interpreted as the signature of damage mechanisms occurring within a 3 nm wide zone at the crack tip. The size of this process zone finds its origin in the local temperature elevation at the crack tip. This effect is reported to be responsible for a transition from a perfectly brittle behavior to a nanoductile one. It explains also why the cluster structure of quasicrystals is not revealed on the fracture surfaces of i-AlPdMn broken at room temperature.

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