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Properties of amorphous SiC films

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The observational horizon of interferometric gravitational wave (GW) detectors is limited by thermal noise in the coating at mid-range frequency, where first GW signals have been detected and many others are expected. The main responsible are the intrinsic dissipations, intimately linked to the inelastic behaviour of the amorphous coating materials. This behaviour is generally explained by the presence of a number of metastable atomic configurations of the amorphous matrix which can switch between two different states by thermally activated processes. Any two of these states that are separated by an energy barrier is called a two level system (TLS). In order to reduce the dissipation of amorphous materials two basic ideas can be pursued: a reduction of the total number density of TLS or an optimal distribution of TLS. Depositing amorphous film of materials whose coordination number is superior to three should lead to a low number of TLS.
Among the candidate high coordination number glasses, we investigated amorphous SiC, interesting for advanced applications and still lacking a deep study. Here are presented structural, chemical, optical and mechanical characterizations of a-SiC films, deposited by Ion Beam Sputtering and Magnetron Sputtering techniques. Furthermore, molecular dynamic simulations to evaluate elastic properties in a wide energetic range are shown.

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