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Resource destroying maps ZI-WEN LIU, Massachusetts Inst of Tech-MIT, XUEYUAN HU, Shandong University, SETH LLOYD, Massachusetts Inst of Tech-MIT — Resource theory is a widely-applicable framework for analyzing the physical resources required for given tasks, such as computation, communication, and energy extraction. In this paper, we propose a general scheme for analyzing resource theories based on resource destroying maps, which leave resource-free states unchanged but erase the resource stored in all other states. The linearity of the resource destroying map depends on the convexity of the set of free states, but the scheme can be applied to any resource. In particular, we introduce a group of simple and general conditions that determine whether a quantum operation exhibits certain resource-free properties. Our theory reveals fundamental connections among basic elements of resource theories, namely free states, free operations and resource measures. Notably, we find a class of simple measures without optimization that are monotone nonincreasing under operations that commute with the resource destroying map. We explicitly discuss our theory in the contexts of coherence and discord-type quantum correlations, two prominent features of nonclassicality, to illustrate properties of resource destroying maps and provide new insights into these highly active fields.

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