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**Title:** *FP*-injectivity relative to a semidualizing bimodule

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In this paper, we extend the notion of  $C$ -injective module to that of  $C$ -*FP*-injective module, where  ${}_S C_R$  is a semidualizing bimodule over associative rings. We first obtain a result on the (pre)covering and (pre)enveloping properties of  $C$ -*FP*-injective modules. Then we study right  $C$ -*FP*-injective dimension of modules via right derived functors of  $\text{Hom}$ . As applications, a necessary and sufficient condition of semidualizing modules having finite *FP*-injective dimension and a new characterization of left noetherian rings are given.

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