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Novel Electronic Order with Staggered Kondo and Crystalline Electric Field (CEF) Singlets SHINTARO HOSHINO, JUN'YA OTSUKI, YOSHIO KURAMOTO, Tohoku University — With two localized f-electrons per site, the ground state of a solid can be a collection of CEF singlets plus the Fermi sea of conduction electrons. If the f-electrons interact strongly with conduction electrons, the ground state can also be a collective Kondo singlet. Competition between these two singlets may give rise to rich physics with exotic ordered phases. We propose a novel staggered order of these two kinds of singlets by using a model with CEF singlet-triplet states and conduction electrons, which are connected together by the Kondo coupling. We have performed highly accurate numerical calculations using the dynamical mean-field theory combined with the continuous-time quantum Monte Carlo method. With one conduction electron per site, we have found a metal-insulator transition temperature below which the staggered singlet order emerges. The computed local density of states shows a peak below the Fermi level at a sublattice for Kondo singlet, and a vacant peak at another sublattice for CEF singlet. These two peaks add up to a double peaked structure as in Kondo insulators. We discuss possible relevance of the results to understanding actual systems such as $PrFe_4P_{12}$ and URu_2Si_2.

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