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Preparation of porous cobalt aluminate and its chromogenic mechanism

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Abstract:

By a novel one-step method with convenient and efficient process, porous cobalt aluminate (CoAl_2O_4) was prepared. The structure, size, morphology, color purity and oil absorption were characterized. The results indicated that when molar ratio of Co/Al reaches 1:3, the performance of cobalt aluminate is the best and most suitable to be anti-counterfeiting additive. To understand the color control mechanism of cobalt aluminate, the electronic properties were calculated by DFT + U method (where U_{eff} is set to 4.25 eV) which predicted a band gap of 1.18 eV for cobalt aluminate and illustrated the potential application of semiconductor. Density of states proved that the influential factor of color control depends on Co^{2+} 3d states and the color range of CoAl_2O_4 can be effectively adjusted.

Keywords: CoAl_2O_4 ; Anti-counterfeiting; Printing ink; Density functional theory; Electronic properties

1. Introduction

Cobalt aluminate has been generally used as an inorganic pigment because of its deep blue and high stability [1-3]. These excellent characters are attributed to the spinel structure. Recently,

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