Reply to "Comment on 'Energy partitioning and particle spectra in multicomponent collision cascades' "

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In his Comment,[1] the author reports on three so-called ''difficulties'' of Ref. 2.

''Difficulty 1'' simply repeats the author's previous affirmation[3] that the differential equations of Ref. 2 applied on a special set of cross sections give negative, and thus unphysical, solutions. In fact, our solutions, Eqs. (41) of Ref. 2, are approximate solutions, and therefore these results can be used only within a certain domain of projectile-target combinations. The example chosen by the author[3] is, however, quite an extreme and strongly unrealistic case of a mixture in which some cross sections are a factor of 100 larger than others. Our paper[2] was written as a means to treat collision cascades with realistic cross sections. As we showed in that paper, our method works well even for the rather demanding case of collision cascades in HfC.

As ''difficulty 2,'' Zhang claims that our definition of the slowing down density $\chi(E)$ and the slowing down energy density $\omega(E)$ are ''wrong.'' However, our definition parallels that of Williams, Ref. 4. Thus, e.g., the slowing down density is the number of particles crossing a given energy (per unit volume per unit time) and analogously for the slowing down energy density. Hence, above the bombarding energy E_0, these quantities vanish, since there are no particles with such energies in the system. Zhang[1] in contrast sets $\chi(E>E_0)>0$ and $\omega(E>E_0)>0$ and thus postulates that even above the bombarding energy, there are moving particles in the system—an obvious contradiction.

''Difficulty 3'' reminds the reader that the total number of recoils as derived by Zhang previously[3] differs from the expression given in our Ref. 2. However, our definition that the total number of recoils generated in a cascade equals the integral over the recoil density is common knowledge, see, e.g., Ref. 5.

In summary, the difficulties mentioned in the Comment[1] are either repetitions drawn from the author's earlier work[3] or constitute new conceptual errors.

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