

Abstract Submitted  
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**Dissipation of compound torsional oscillator loaded with solid  $^4\text{He}$  containing  $^3\text{He}$  impurity level from 0.3 to 25 ppm**<sup>1</sup> PATRYK GUMANN<sup>2</sup>, MICHAEL KEIDERLING, DAVID RUFFNER, Rutgers University, HARRY KOJIMA — High sensitivity of supersolid phenomenon in solid  $^4\text{He}$  to low levels of  $^3\text{He}$  impurity( $x_3$ ) is a puzzle not yet understood. We have analyzed the data taken using our compound torsional oscillator on the variation of dissipation as  $x_3$  was varied between 0.3 and 25 ppm. The compound oscillator allows studies of the dissipation at two oscillator mode frequencies(0.5 and 1.2 kHz). Arrhenius plots of temperatures, where peaks in dissipation occur, vs. frequency allow extracting the activation energy and the characteristic time. The data are consistent with distributions of activation energy whose widths increase with  $x_3$  but the mean value of  $\sim 430$  mK independent of  $x_3$ . The characteristic time varies approximately as  $\propto x_3^{2/3}$ . Temperature dependence of the dissipation is consistent with Debye model but frequency dependence is not. We give an interpretation of the characteristic time in terms of diffusion of  $^3\text{He}$  along dislocation lines.

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